ARTICLE XXV.—*Observations on some Cretaceous Fossils from the Beyrût District of Syria, in the Collection of the American Museum of Natural History, with Descriptions of some New Species.* By R. P. WHITFIELD.

Much interest has been taken, from time to time, by many persons, in the fossil organic remains obtained from that portion of Syria embraced in Palestine and the Lebanon district; and although much has been written on the geology of this region, and several valuable memoirs on its fossil remains published, still much doubt remains in regard to the exact geological equivalency of the strata of the region. Consequently, any help that can be afforded, or light thrown upon the organic remains of these strata, is quite desirable. Very recently (1890) Dr. Max Blanckenhorn has published a very valuable memoir, "Beitrage zur Geologie Syrien," Cassel, in which he has worked over the palæontological writings of previous authors in this field (Conrad, Lartet, Frass, Noetling, Hamlin, etc.), and has figured and described some new and some previously-described species. When the announcement of Dr. Blanckenhorn's paper was first made, I was at work on a collection of Molluscan remains (Lamellibranchiates and Gasteropods) from the Beyrût district, obtained from the Rev. Dr. William Bird, of the American Board of Commissioners for Foreign Missions, located at Abeih. Part of the collection was originally sent to this country for the use of Dr. P. E. Hamlin, who published a memoir (Mem. Mus. Comp. Zoöl., Cambridge, Mass., 1884, Vol. X) on a previous lot, obtained partly from the same source and partly from the Rev. Selah Merrill, D.D. This later collection, unfortunately, did not reach Cambridge until after Dr. Hamlin's death; and, after remaining some years in storage, was purchased by this Museum. Subsequently, a second lot was obtained from Dr. Bird by myself; and it is upon these combined collections that the following remarks are based, and from which the new species are obtained. It will at once be seen that this collection has furnished a large number of new forms; but it by no means exhausts the Molluscan fauna of the region in these two classes of organisms, for I have still

quite a number of species represented by specimens that are not sufficiently well preserved for description and illustration.

It will not be necessary to enter into an elaborate or extended discussion of the geological relations of the various beds from which these fossils were obtained. This has already been done to some extent by Dr. Hamlin in his memoir, but much more elaborately by Louis Lartet, Geologist to the Geol. Exp. of the Dead Sea by the Duc de Luynes in 1864, published in the Ann. des Sci. Geologiques for 1869 and 1872; also by Prof. Frass, of Stuttgart, in his "Aus dem Orient," part I and II; by Prof. Dames, Dr. Noetling and several other authors, as well as what was previously given in the Official Report on the United States Exploration of the Dead Sea and River Jordan, under Lieutenant W. F. Lynch, Baltimore, 1852, and more recently by Dr. Max Blanckenhorn in the work above referred to. It will only be necessary to state that the prevailing opinion of all the later writers is, that the formation from which these fossils are obtained is Cretaceous and not largely Jurassic as supposed, and stated by T. A. Conrad in his report given in the Lynch expedition.

It will be necessary, however, for me to make remarks on many of the species, as I am convinced that many of those originally described by Mr. Conrad have been misunderstood, and others redescribed by subsequent writers under new names. Mr. Conrad's material was very poor, as well as of very limited extent. He, however, was not to blame for that. Many of his species were undoubtedly described from single individuals, and those in the poorest state of preservation for determination, namely, that of internal casts,* collected from the surface, after much weathering, and very imperfect, then poorly illustrated and poorly described. Still, as they stand as accepted species in catalogues, it is well to verify them as far as possible and to retain the names for those species to which they were originally applied. Among the collections obtained from Dr. Bird I have been able to identify many of Conrad's species, and following I

* Severe criticism has often been made as well as censure applied to persons for describing species based entirely upon internal casts of fossils, such as many of these here used. But if such critics will consider that by far the greatest number of localities of Cretaceous fossils the world over furnish only casts of most groups of organic remains, and that we must have some means of comparing and identifying these organic bodies, they will recognize that their criticisms and censure are uncalled for.

give a list of all those which I recognize which have been described up to the present time, including also those here described for the first time. They are also tabulated so as to show from which bed they are derived, giving their relative geological horizon. The localities are those given by Dr. Bird, and the following table of horizons of localities is also from his dictation. There are six distinct beds of Cretaceous rocks within the geographical limits covered by these fossils, the lowest of which is above the zone of the *Cidarites glandarius*, Lang., below which comes the Jurassic beds of Mejdel es Shems. These are as follows, with their localities as used in the following pages, beginning with the upper:*

No. 6. *Chalk.* Andrafil; Scweifat; Hawkil; Besaba.

No. 5. *Gazelle Mt. Cherts.* Gazelle Mt.; Gurzûz; East of Matully; Zachalta, between Matully and Gureefy.

No. 4. *Naaman Clay-limestones.* Ruiset Naaman; Bhamdûn.

No. 3. *Brown Clay, Gasteropod Clays, &c.* Between Shimlan and Aitath; Muktara; Ain Kesûr; Abeih; Bhamdûn.

No. 2. *Bewerty Beds, Nerinea Clays.* Bewerty; Marahh; Kurkafy; Ain Anûb; Gazelle summit.

No. 1. *Abeih Sandstone.* Abeih; Duccûn, Olive locality; Klelay; Andrifil.

*I have made every reasonable effort to find the originals of Mr. T. A. Conrad's species described in the Official Rept. of the U. S. Exped. to the Dead Sea and River Jordan, under Lieut. W. F. Lynch, for the purpose of identification and comparison, as well as verification; they seem, however, to have been entirely lost sight of, as inquiries of the different societies and persons having charge of collections, where they might have been deposited, have entirely failed to bring any of them to light.

List of all the determinable Cretaceous Species of Molluscan Fossils recognized in the Syrian Collections of the American Museum of Natural History.

LAMELLIBRANCHIATES.	1	2	3	4	5	6	
Ostræa succini, Frass.=O. alicula, Ham	×						Olive loc. near Abeih.
O. (Exogyra) Menneti (Coq.), Lartet					—×		Matully.
O. (" ?) Dieneri, Blanck	×						Olive loc.
Exogyra Africana (Lam.), Lartet						×	Hawkil.
E " flabellata, D'Orb						×	Andrifil and Besaba.
Gryphæa capuloides, Conrad	×						Ain Anub and Abeih.
Pecten obrutus, Conrad		×					Marahh.
Vola quinquecostata, Sow. sp				×			Ruweiset Naaman.
Lima tenuitesta, W., n. sp					×		Gazelle Mt. and Gurzûz.
Plagiostoma sp.? res. Lima rigida (Desh.), Goldf	×+						Antura.
Radula Naamanensis, W				×			Naaman.
Perna orientalis, Haml	×						Abeih, Kleelay, Olive.
P " Palestina, W	×						Klelay.
Gervillia obesa, W	×						Andrifil, below Chalk.
G " perobesa, W	×						½ m. from Abeih.
G " trepezoidalis, W		×					Bewerty.
Pterinoperna Syriaca, W		×					"
*Inoceramus Lynchi, Conrad				×			R. Naaman.
Lithodomus stamineus, Conrad				×			"
Trigonarca Palestina, W	×						Olive loc.
Idonearca oviformis=*Arca oviformis*, Con			×				Aitath (near).
I " Syriaca=*Arca Syriaca*, Con., and *A. orientalis*, C.			×				Aitath and Ain Kesûr.
Arca longa, Conrad				×			
A " brevifrons, Con.=*A. indurata*, Conrad				×			R. Naaman.
Cucullæa parallela, Conrad	×						Olive loc.
Pectunculus sp.?	×						"
Nucula crebrilineata, Conrad. See Lucina crebrilineata							
*Nucula Mauritiana, Coquand?				×			Naaman.
N " ? obtenta, Conrad, *probably a Tancredia*				×			"

*?Nucula *perobliqua*, Conrad	...	×	....	....	....	....	Marahh.
N " submucronata, Conrad	....	....	×	....	....	....	Bhamdun.
N " glanstriticea, W	×	....	....	..	....	....	Olive.
*Trigonia Syriaca (Con.), Frass	×	....	....	....	....	....	Duccûn.
T " cuneata, Conrad	....	×	...	....	....	....	Marahh.
T " Lewisi, Blanck	....	×	....	....	....	....	"
*T " pseudocrenulata, Noetling	×	....	....	....	....	....	Duccûn.
*T " undulatocostata, Blanck	....	—×	....	....	....	....	R. Naaman.
Cardita subrotundata, Conrad	...	....	×	....	....	....	Aitath.
*C " lacunar, Hamlin	×	....	....	....	....	....	Olive loc.
C " Rawsoni, W	....	....	?	....	....	....	Palestine.
Astarte engonata, Conrad	....	....	....	×	....	....	R. Naaman.
A " lintea, Conrad	×	....	....	....	....	....	Duccûn.
A " lucinoides, Conrad?	....	....	....	....	×+	....	Gazelle Mt.
A " orientalis, Conrad	....	×	....	....	....	....	Marahh.
Opis megambona, W	....	×	....	....	....	....	Bewerty.
Platopis abrupta=*Nucula abrupta*, Conrad	×	....	....	....	..	....	Duccûn.
P " obruta=*Opis obruta*, Conrad	....	×	....	....	....	....	Bewerty.
P " plicata, W	×	....	....	....	....	....	Abeih.
P " triangularis, W	×	×	....	....	....	....	Olive.
P " undata=*Opis undatus*, Conrad	....	×	....	....	....	....	Marahh.
Eriphyla crenulicosta, W	....	×	....	....	....	....	Bewerty.
Scambula secunda, W	×	....	....	....	....	....	Olive loc.
*Lucina crebrilineata=*Nucula crebrilineata*, Con.?	×	....	....	....	....	....	"
L " sp.? about 4 cm. in diameter=L. Safedensis, C.?	....	....	...	....	×	....	Gazelle Mt.
L " percancellata, W	×	....	....	....	....	....	Olive loc.
Tancredia Aleihensis=*Corbula Aleihensis*, Conrad	×	....	....	....	....	....	Abeih.
Hippurites plicatus, Conrad=*H. Lewisi*, Frass	....	....	×	....	....	....	Aitath.
H " liratus, Conrad	....	....	....	...	×	....	Gazelle Mt.
Cardium (Protocardium) Hillanum, Sow	....	...	×	....	....	....	Aitath and Shimlan.
*C " (") bellum, Conrad	×	....	....	....	....	....	Duccûn.
C " (") Judiacum, Hamlin	×	....	....	....	....	....	"
C " (??) Birdanum, W	×	....	....	....	....	....	"
C " (Acanthocardium) crebriechinatum, Conrad	....	....	....	×	....	....	R. Naaman.

* See notes on these species.

LAMELLIBRANCHIATES—*Continued.*	1	2	3	4	5	6	
Cardium (Serripes ?) Bewertensis, W.	×	×	×	×	....	....	1 Duccûn, 7 Bewerty, 2 Aitath, 2 Naaman.
Trapezium Naamanensis, W.	....	....	....	×	....	....	R. Naaman.
Veleda elliptica, W.	×	....	....	....	....	....	Olive loc.
Gonodon ? hebes, Hamlin.	×	....	....	....	....	....	Duccûn.
Corbicula (Batissa) Hamlini, W.	×	×	....	....	....	....	Duccûn, Marahh.
Corbiculopsis Birdi, W.	×	....	....	....	....	....	Duccûn.
Dosinia Forgemolli= *Venus Forgemolli* (Coquand), Lartet.	....	×	....	....	....	....	Marahh.
Caryatis globulus, W.	×	....	....	....	....	....	Olive loc.
Callista Syriaca, W.	....	....	....	×	....	....	Naaman.
C " [Cyprina] Abeihensis, Hamlin	....	....	×	....	....	....	Bet. Aitath and Shimlan.
Isocardia Merilli, Hamlin.	....	....	....	×	....	....	Naaman.
Cytherea indurata, Conrad.	....	....	×	....	....	....	Bet. Aitath and Shimlan.
C " Syriaca, Conrad.	....	....	....	×	....	....	" "
C " Libanotica, Frass.	×	....	....	....	....	....	Duccûn, Olive loc.
? Tellina Syriaca, Conrad.	....	....	....	×	....	....	Naaman.
Arcopagia planissima, W.	....	....	×	....	....	....	Shimlan.
Donax minutissimus, W.	×	....	....	....	....	....	Olive loc.
Mactra Olivensis, W.	×	....	....	....	....	....	"
M " pervetus, Conrad.	....	....	....	×	....	....	Naaman.
Pholadomya decisa, Conrad.	....	....	....	....	×+	....	Ain Zchalta.
P " depacta, Hamlin.	....	....	×	....	....	....	Aitath and Bhamdun.
Cymella (Pholadomya ?) Vignesi (Lartet), Blanck.	....	....	....	....	....	×	Besaba.
Anatina orientalis, W.	....	....	....	....	....	×	Shweifat.
Corbula aligera, Hamlin.	×	....	....	....	....	....	Olive loc.
C " congesta, Conrad.	....	....	×	....	....	....	Bhamdun.
C " neæroides, Blanck.	×	....	....	....	....	....	Duccûn, Olive loc.
C " olivæ, W.	×	....	....	....	....	....	Olive loc.
C " sublineolata, Conrad.	×	....	....	....	....	....	"
Panopea pectorosa, Conrad.	....	....	×	....	....	....	Abeih.
P " didonis=*Mactra didonis*, Coq.?.	....	....	×	....	....	....	"

GASTEROPODA.							
Fusus Bhamdunensis, Blanck.	....	....	×	× ?	....	....	Bhamdun, Naaman ?
Caricella planilirata, W.	....	....	×	....	....	....	Bet. Shimlan and Aitath.
Volutomorpha orientalis, W.	×	....	..	....	....	....	Duccûn.
*Drillia pleurotomoides=*Aporrhais pleurotomoides*, Blanck.	×	....	....	....	....	...	Olive loc.
Mangelia solitaria, W.	..	....	....	...	×	....	Gazelle Mt. top.
Strombus Mermeti (Coquand), W.	....	....	×	....	....	....	Bet. Shimlan and Aitath.
S " (Melo) pervetus (Conrad), Ham.	....	....	×	....	....	....	" "
*Alaria monodactyla, Hamlin.	....	×	....	× ?	....	....	Marahh, Naaman ?
Anchura petrosa, Con. sp.=*Cancellaria petrosa*, Con.	×	..	....	....	....	....	Olive loc.
Rostellaria (Anchura) Rustemi, Frass.	....	....	....	....	×	....	Gazelle Mt.
Natica? indurata, Con.	....	....	....	×	....	....	R. Naaman, Besaba, Ain Kesûr.
*N " ? scalaris, Con.	....	....	×	....	....	....	Ain Kesûr, Aitath.
Naticopsis ornata, Frass.	×	....	....	....	..	...	Duccûn.
Natica patuliformis, Frass.	×	....	....	....	....	....	"
Ampullina fluctuoides, W.	×	×	..	....	....	....	Olive, Bewerty.
A " " var. acuminata, W.	....	....	....	....	×	....	Gazelle Mt.
A " minima, W.	....	....	....	....	×	...	Gazelle Mt. summit.
*Gyrodes orientalis=*Natica orientalis*, Conrad	....	×	....	....	....	....	Marahh, Bewerty.
*Amauropsis Abeihensis, Hamlin.	×	....	....	....	....	....	Olive loc.
Neverita patula, W.	×	....	....	....	..	....	Duccûn.
Vanikora. See Fossarius.							
Scalaria Bewertensis, W.	...	×	....	....	....	....	Bewerty.
S " novem-varicosa, W.	×	....	....	....	....	..	Olive loc.
Turritella Betmerensis, Blanck	...	....	....	...	×	..	Gazelle Mt. summit.
T " Damesi, Blanck.	×	....	....	....	..	....	Olive loc.
T " [Mesalia] Kokeni, Blanck.	×	..	....	....	....	...	Duccûn.
*T " peralveata, Conrad.	×	....	....	....	....	....	Duccûn, olive loc.
T " Seetzeri, Lartet	×	..	....	....	....	....	Olive loc.
T " Syriaca, Conrad	....	....	....	....	....	....	
Mesalia Abeihensis=*Glauconia Abeihensis*, Blancken.	×	...	....	....	....	....	Duccûn, Olive loc.
M " Gazellensis, W.	....	....	....	....	×	....	Gazelle Mt. summit.
Tubulostium rugosum, W.	...	×	....	....	....	....	Bewerty.
Chemnitzia Syriaca, Frass.	....	....	....	....	×	....	Gazelle Mt. summit.

* See notes on these species.

GASTEROPODA—*Continued.*	1	2	3	4	5	6	
Odostomopsis Abeihensis=*Phasianella Abeihensis*, Blacken. and=*Pyramidella amœna*, Blanck	×						Olive loc.
*Obeliscus bilineatus=*Cerithium bilineatum*, Conrad	×	×					Klelay, Bewerty, Gazelle Mt. summit?
*Nerinea Bhamdunensis, Conrad=*N. minima*, Blancken.			×				Bhamdun.
N " Fleuriausa (D'Orb.), Frass		×					Kurkify.
*N " cochleæformis, Conrad=*N. gammifera*, Lartet; *N. pauxilla*, Hamlin					×		Gazelle (cherts).
*Nerinea cretacea, Conrad		×					Bewerty.
*N " mammillæ, Frass	×						Abeih, Duccûn, Ain Kisûr.
N " nobilis, Munster					×		Gazelle chert bed, West of Dead Sea, Matully.
N " Scheckii, Frass		×					Kurkify.
*N " Syriaca (Conrad), Blancken				×			Bet. Shimlan and Aitath.
*Cryptoplocus Libanensis, Hamlin	×						Klelay.
Fossarius neritopsoides=*Vanikora neritopsoides*, Blancken	×						Olive loc.
*Cerithium magnicostatum, Conrad=*Turritella magnicostata*, Conrad	×				×		Duccûn, Abeih, Olive loc., Gazelle cherts.
Cerithium acuticostatum, Blancken		×					Bewerty.
C " æquicostatum, Blancken	×						Duccûn.
C " excavatum var. Syriacum, Blanck	×						Olive loc.
C " Conradi, W	×						Duccûn.
*Tympanotus orientalis=*Nerinea orientalis*, Conrad; *Cerithium Libanoticum* (Frass.), Blanck	×						"
Potamides distortus, W	×						"
Vertagus coloratus, W	×						Olive loc.
Cerithiopsis cretacea, W	×						"
Nerita Abeihensis, W	×						"
N " bidens, W	×						"
N " pogoda, W	×						"
Neritopsis ornata, Frass	×						Duccûn.

Pileolus sphærulitum, Blancken	....	....	....	....	×	..	Gazelle cherts.
Turbo Moreli, Frass.	×	....	....	....	....	....	Duccûn, Olive.
Trochus (Turcica) crispus, Blancken	.	....	....	....	×	..	Gazelle cherts, Gurzûz.
T " striætofundus, W.	×	....		....	..	....	Olive loc.
Monodonta antiqua, W.	....	....	....	....	×	....	Gazelle cherts.
*Leptomaria simplex (D'Orb.), Frass.?	....	....	....	×	..	....	R. Naaman.
Philine (Megistostoma) patula, W.	×	....	....	....	....	....	Duccûn.
*Actæonina vafra, Hamlin=*Natica olivæ* (Frass), Blanck.	×	....	....	....	....	....	Duccûn, Olive loc.
A " Syriaca, W.	....	×	....	....	× ?	....	Klelay, Gazelle cherts?
Actæonella Salomonis, Frass.	....	....	....	....	×	....	West of Dead Sea.
*Triptycha abbreviate=*Nerinea abbreviate*, Con.; *Actænella Absalonis*, Frass	....	×	....	...	....	...	Bewerty.
Tornatella Abeihensis, W.	×	....	....	....	....	....	Olive loc.
*Colostracon Lewisi, Frass.	×	....	....	....	....	....	Duccûn.
*Tylostoma Birdana, Hamlin	×	....	..	....	....	....	Olive loc., Duccûn.
T " depressa (Pictet & Camp), Hamlin	....	....	×	....	....	....	Bet. Shimlan and Aitath.
T " gradata, Hamlin	×	....	....	....	....	....	Duccûn.
*T " Syriaca=*Chenopus Syriaca*, Conrad.	....	...	×	....	....	....	Near Naaman, 6 m. E. Aitath.
T " indurata=*Chenopus induratus*, Con.; *Amauropsis subcanaliculata*, Hamlin	×	....	....	....	....	....	Duccûn.
Tylostoma Gazellensis, W.	....	....	....	....	×	....	Gazelle Mt. summit.
T " triplica, W.	....	....	....	....	×	....	Gazelle cherts.
T " Martini, W.	....	..	....	....	×	....	Gurzûz chert.
Globiconcha altispira, W	....	....	×	....	....	....	Ain Kesûr.
Akera siliciosa, W.	....	....	....	....	×	....	Gazelle chert.
Dentalium cretaceum, Conrad	....	....	×	....	....	....	Bhamdun.

* See notes on these species.

LAMELLIBRANCHIATA.

SPONDYLIDÆ.

Genus LIMA, *Brugiere.*

Lima tenuitesta, n. sp.

PLATE 4 A, FIGS. 1 AND 2.

Shell of medium size, subovate in general form, and measuring about three and a half centimeters in length; valves moderately convex, extremely thin and fragile. Hinge line short, equal to two-fifths of the width of the body of the shell below, and entirely confined to the posterior side of the apex; area very distinct on each valve, the median depression quite distinct, nearly half the width of the area. Basal side vertical or overhanging, the umbonal ridge being sharply angular, posterior wing distinct and depressed. Surface marked by fine, low, flattened, bifurcating radii, strongest and most distinct near the posterior margin.

The species is a very marked one, and easily recognized from its extremely thin and delicate shell, as well as the fine bifurcating striæ. Much resembles *Lima undata* Desh. D'Orb., Pal. France, Vol. 3, Pl. 414, fig. 9, but the striæ are more than as fine again.

Locality.—In the Cherty layers at Gurzûz and Gazelle, near Abeih, Syria.

Genus RADULA, *Klein.*

Radula Naamanensis, n. sp.

PLATE 4 A, FIGS. 3 AND 4.

Shell small and very oblique, with ventricose valves, which are rather strongly radiated, radii numbering about eighteen or twenty. Hinge very short, the auriculations scarcely discernable from the upper side. Surface marked by very fine concentric striæ which cross the radii, but are barely seen by the unaided eye.

Several individuals of this species are present in the collections used, but all are in a rather poor state of preservation, still retaining all the external features of the shell. It is peculiar among its group from the great obliquity of the shell to the hinge, in

this feature being more extreme than any of the several American species of the genus. The specimens are usually about three-fourths of an inch (nearly two centimetres) in extreme length.

Locality.—In the clays at Naaman, N. E. of Abeih, Syria.

AVICULIDÆ.

Genus GERVILLIA, *De France.*

Gervillia obesa, n. sp.

PLATE 4 A, FIGS. 5–7.

Shell below a medium size, moderately oblique, the axis of the shell having an angle of about 45° to the line of the hinge. Both valves quite ventricose, the left one most distinctly so, although the beak usually appears lower than that of the right one, owing to the form and twist of the valves. Hinge area moderately high, but very variable, being from about one mm. to three or even four on valves varying but slightly in size; crossed by four or five strong, deep, ligamental pits, none of which are found anterior to the beaks, while on the interior the hinge plate is marked by numerous fine oblique teeth, like those of *Pterinoperna.* Anterior wing large, full and ventricose, very distinctly separated from the body of the shell by a deep constriction; posterior wing usually rounding into the posterior margin of the shell, but occasionally being slightly pointed.

Surface of the shell strongly lamellose, and the left valve obscurely marked by a few indistinct radii along the umbonal ridge; that of the right valve only lamellose and more flattened on the umbo and umbonal ridge, and the anterior wing much more flattened. In an anterior profile view the valves show a decided twist toward the left hand from the hinge to the anterior constriction below, where they again curve to the right.

This will be readily distinguished from the two species of *Perna* described from this same region by Mr. Hamlin, in the Mem. Mus. Comp. Zoöl. by the presence of the anterior wing, which does not exist on either of those. It somewhat resembles *Pteroperna costatula* Lyc. sp. from the great Oolite of England, but is more robust, less oblique, with a rounder anterior and much shorter posterior wing.

Locality.—In beds equivalent to the Abeih sandstone at Andrafil, near Abeih, Syria.

Gervillia perobesa, n. sp.

PLATE 5, FIGS. 6–8.

Shell moderately large, somewhat ponderous, and very ventricose, the left side being the larger and most inflated; beak prominent and slightly incurved, while that of the right side is appressed, and does not reach to the hinge margin. Hinge area high, about equal on each valve, and marked by three broad, deep ligamental pits, the distance between each greater than the width of the pits. Axis of the valves curved, at first forming an angle of about 60° with the hinge line, but later curving backward quite rapidly. Anterior wing comparatively small, inconspicuous; posterior wing not extended; posterior slope distinctly separated from the body of the shell on each valve, but most distinctly so on the left; posterior basal margin extended beyond the line of the wing margin in a rounded tongue-like projection. Surface of the shell strongly lamellose, and on the left valve along the body of the valve by four or more elevated radii. Of the type of *G. Renauxiana*, Math., as figured by D'Orb., Pal. France, Vol. 3, Pl. 398, but is more inequivalve and more arcuate.

Differs materially from the *G. obesa* above described in the much greater size; smaller anterior wing; curvature of the body, and less obliquity of the axis, and particularly in the less number of ligamental pits of the hinge area.

Locality.—In the Abeih sandstone, one and one-half miles from Abeih, Syria.

Gervillia trapezoidalis, n. sp.

PLATE 4 A, FIGS. 11 AND 12.

Shell small, only right valves known, axis of the shell moderately oblique, body of the shell depressed-convex, triangularly trapezoidal in form, pointed at the beak, rapidly widening below and recurved at the postero-basal angle, distinctly separated from the wings by sharp constrictions; both wings depressed, the anterior one proportionally large, convex, protruding below the

hinge line, and very sharply divided from the body of the shell; posterior wing concave, much shorter than the body of the shell below, and the intermediate margin broadly concave. Hinge area moderate, marked by two or more oblique ligamental pits, and the inner surface of plate presenting a few vertical striæ-like teeth. Surface of the shell marked by lamellose lines of growth. No radii have been observed on this valve.

In general form this species somewhat resembles the right valve of *G. obesa* herein described, but differs in the smaller anterior wing, more decided posterior wing with its distinct line of demarcation between it and the body of the shell, which on one specimen gives the posterior umbonal ridge a distinct angulation; also in the triangular form of the body, and especially in the recurvature of the postero-basal portion.

Locality.—This shell has as yet been seen only in a light yellowish clay filled with *Nerinea*, at Bewerty, about three miles directly west of Abeih, Syria, and coming above the Abeih sandstone and brown clays. It is distinguished in the section as the Bewerty bed.

Genus PTERINOPERNA, *Morris & Lycette.*

Pterinoperna Syriaca, n. sp.

PLATE 4 A, FIGS. 13 AND 14.

A single left valve of this shell only has been observed. It is of moderate size and oblique, the body of the shell forming an angle of about 45° with the line of the hinge, and is depressed convex on the surface, with a distinct, pointed, but not incurved beak; the body rapidly widens below, the anterior margin being nearly vertical to the hinge; anterior wing narrow, pointed and depressed; posterior wing long, slender and deeply divided from the body of the shell, strongly marked on its surface by distant coarse, lamellose lines of growth, somewhat angular on the surface a little below the middle, representing the usual ridge characteristic of the posterior wings of this genus of shells. Disc of the shell marked by broad but rather obscure radii. The hinge area of this valve, externally, is narrow, and does not extend along the valve posteriorly far from the beak, but the inner hinge

plate is broad and well developed, and marked by numerous slender oblique teeth; those beneath the beak shorter and somewhat more vertical as well as more closely arranged than those on the posterior portion of the hinge.

Locality.—Found at Bewerty, about three miles west of Abeih, Syria, in the yellowish-brown clays.

Perna Palestina, n. sp.

PLATE 4 A, FIGS. 8-10.

Shell of medium size or larger, having a vertical height from hinge line to base of 6½ cm., and a transverse diameter across the widest part of about 5 cm.; the thickness of the two valves together being 32 mm. Form erect, subovate, the hinge line at right angles to the axis of the body, and shorter than the width of the shell below. Valves subequal, the anterior side deeply indented and grooved by the byssal notch, but not open. Ligamental area moderately wide with ten ligamental grooves, which are slightly wider than the intervening spaces, and are deeply excavated. Surface of the shell smooth, with comparatively strong but very regular concentric lines of growth, which are scarcely lamellose, except on the anterior margin. The left valves shows evidence of obscure, distant, but broad radii on the middle portions of its area. Shell thick and dense.

This species differs from any of the other Syrian forms of the genus in being a somewhat larger species, in its greater proportional length and in its surface character and nearly equally convex valves.

Locality.—In the Abeih sandstone near the top, at Klelay, near Abeih, Syria.

Inoceramus Lynchi, *Conrad,* Off. Rept. Lynch's Expl. Dead Sea, p. 218, Pl. 8, fig. 47.

This shell has been referred to *Pholadomya ligeriensis,* D'Orb., both by Drs. Frass and Blanckenhorn. A number of specimens preserving the casts of both valves united are present in our collection, as well as casts of single valves. They are all from Naaman, Syria, from a clay bed which comes just above the

brown clays of the gasteropod bed and under the cherts of Gazelle Mt., or the Rudistes bed; and although they show no fragment of the shell, I think they are undoubtedly *Inocerami*, as they possess the straight posterior hinge line with other features of that genus, and all appear to have been somewhat inequivalve. They certainly do not present the features of *Pholadomya;* and, comparing them with d'Orbigny's figures of the above-named species, I can see no very close relationship. Consequently I have retained Mr. Conrad's name for it.

ARCIDÆ.

Genus TRIGONARCA, *Conrad.*

Trigonarca Palestina, n. sp.

PLATE 5, FIGS. 1 AND 2.

Shell in the adult stage measuring 9 mm. in total length by 6 mm. high at the beaks, and having a thickness through the valves, at the fullest part of the umbonal ridge, of 5 mm. Form sub-trapezoidal, the beaks being large, prominent and situated more than one-third of the entire length from the anterior end; hinge line very short; posterior end prolonged, acutely pointed at the basal angle; basal line straight for more than two-thirds of the shell's length, from whence it rounds into the anterior end, which is somewhat sharply rounded; posterior cardinal slope nearly vertical, concave between the posterior margin of the shell and the acutely carinate umbonal ridge. Disc of the shell marked by rounded, radiating ridges, with interspaces on the anterior part of equal width; toward the posterior part the radii are more closely arranged; cardinal slope marked by curved radii, and the whole crossed by finer concentric ridges, which give a finely crenulated structure to the whole surface.

This shell is of the form and size of *T. cuneiformis*, Conrad (Pal. New Jersey, Vol. 1, Pl. 12, figs. 17 and 18, p. 88; Monog. IX, U. S. Geol. Surv.), but is less ventricose, not so cuneiform posteriorly, and has a shorter hinge line.

Locality.—Two individuals only, from the Abeih sandstone, at the olive locality near Abeih, Syria.

NUCULIDÆ.

Genus NUCULA, *Lamarck.*

Nucula glanstriticea, n. sp.

PLATE 5, FIGS. 3–5.

Shell almost minute, the largest one seen being scarcely 6 mm. long by 4 mm. high and thick; form subcylindrical and very ventricose; beaks small, terminal anteriorly, approximate; hinge line curved, extending almost to the posterior extremity, marked by about twelve highly elevated teeth on the posterior side and by five or six smaller ones on the anterior side of the beak; basal line arcuate, curving upward posteriorly; surface marked by fine, even concentric striæ; posterior adductor muscular scar quite deep, the anterior scar obscure.

This small shell has much the form of a grain of wheat, whence the name.

Locality.—In the Abeih sandstone at the olive locality near Abeih, Syria.

Nucula crebrilineata, *Conrad.*—Specimens which I have identified with this species, and which represent it very closely, are not *Nuculoid*, but would appear to be more nearly related to some group of *Lucina*, but a sufficient knowledge of their interiors cannot be obtained to be satisfactory.

Nucula perobliqua, *Conrad*, Offic. Rept. Lynch's Dead Sea Exp., Pl. 3, fig. 18.

The casts of this shell, as I have identified it, agrees exactly in all its characters with Conrad's figures and description, but when the shell is present it shows a distinct external ligament, and on one cast one can imagine a pallial sinus. On these evidences I have supposed it may have been a species of *Caryatis.*

TRIGONIDÆ.

Trigonia Syriaca, *Conrad*, Off. Rept. Lynch's Dead Sea Expl., pp. 214, 232, Pl. 3, figs. 19–23, Pl. 4, Appendix, fig. 26.

This species has caused more confusion than any other shell in the series. Conrad included several forms originally under the

one name. The first figure which he gives, fig. 19 of Pl. 3, being the only one representing an adult specimen, and ought properly to be taken as the type of the species. An artificial cast made in an old pair of separated valves of *T. pseudocrenulata*, Notl., Zeitsch. der Deutsch. Geol., Gesel., 1886, p. 862, Pl. 25, fig. 5, gives precisely the outlines of Conrad's figure. Consequently I think that shell should retain the specific name *T. Syriaca*. With Conrad's *T. cuneiformis* I had identified that figured by both Noetling and Frass as *T. Syriaca*, basing my identification upon its general form and from an internal cast made as above-described in a pair of separated valves. A natural cast of this latter species (compressed) gives an almost exact copy of Dr. Blanckenhorn's figure of *T. regularicostata*. Since several authors unite in considering the form figured by Frass and Noetling as *T. Syriaca* it may be well to accept it, but, however, as Conrad's species. Conrad's figure 21 of Pl. 3, Off. Rept., if a *Trigonia* at all, is probably *T. undulatocostata*, Blanckenhorn. While his figure 26 of Pl. 4 App., is most likely a fragment of a large *Cardium Judiacum*, Hamlin.

Trigonia undulatocostata, *Blanck.*, Beitrage zur Geol. Syriens, p. 83, Pl. 5, fig. 5.

I have very good specimens of this species from the brown clays above the Abeih sandstone at Ruiesset Naaman, Syria. The shell is much prolonged posteriorly, with nearly anterior beaks, which are rather small and closely coiled. On the older specimen the undulations become obsolete along the base and posterior end. The height of the shell is to the thickness through the valves as six is to five; and the height and length nearly as two to three. In the interior the hinge teeth are large and finely corrugated on the sides.

ASTARTIDÆ.

Genus CARDITA, *Bruguiere.*

Cardita Rawsoni, n. sp.

PLATE 5, FIGS. 9 AND 10.

Shell attaining a medium size, very ventricose and rotund, with large, incurved, nearly anterior, beaks, which scarcely project

above the line of the posterior cardinal border; posterior end obliquely truncate, but not squarely so, the margin being somewhat rounded; basal line and anterior end regularly curved. Surface of the shell unknown, as only the casts have been seen, and they show no evidence or surface radii, indicating a very thickened shell, or a comparative finely radiated surface. The space between the beaks is very deep and wide, showing a much thickened hinge plate, and the markings left by the teeth are broad and strong.

The shell is so distinct in its short anterior end and inequilateral form from any of the species described from Syria, that I have not hesitated to describe it. Although the exact locality is not known, further than that it is from the Beyrût district. The specimens were received from A. L. Rawson, Esq., and present the lithological features of the brown beds above the Abeih sandstones.

Genus OPIS, *DeFrance.*

Opis megambona, n. sp.

PLATE 5, FIGS. 11 AND 12.

Shell below medium size, extremely ventricose, cordiform, with proportionally very large, very prominent, enrolled beaks, which stand up above the hinge line nearly or quite equal to one-third of the height from the hinge line to the base of the shell. Body of the shell below the beaks transversely ovate, widest posteriorly, the anterior end being narrowly rounded. Lunule very large and very deep, rounded at the bottom; escutcheon distinct, but not deep. Surface of the shell marked by numerous strong, elevated and rounded concentric ribs, with wider interspaces. Ribs strongest on the middle of the shell, becoming less distinct and indefinite at either end. Finer concentric striæ occur between the ribs.

I have not seen the hinge line of this shell, and only refer it to *Opis* from its large enrolled beaks, large lunule and depressed posterior cardinal area. The general form, except for the large beaks, would be that of *Astarte.* The posterior umbonal ridge appears to have been only moderately marked, and on most of

the examples is scarcely visible, though the specimens are all much distorted.

Locality.—In the clayey marls above the Abeih sandstone at Bewerty, near Abeih, Syria.

PLATOPIS, new genus.

Among the Lamellibranchiata shells from Syria are several species having similar characters, but which I can refer to no established genus. Two of these were described by T. A. Conrad in Lynch's Report, under the genus *Opis*, DeFrance, *O. undata* and *O. obruta*. A similar form has been described by Stoliczka in his Pal. Indica, Vol. 3, p. 296, Pl. 5, figs. 15–19, as *Crassatella, C. zitteliana*. Among the specimens in this collection are examples showing the hinge structure of three species, and partially that of two others; and show them to differ entirely from *Opis* in these parts, and more distinctly so from *Crassatella*. From the latter they differ in having the ligament external, and in the hinge teeth, and in being destitute of internal ligamental pit. From *Opis* they differ radically in the hinge structure; there being generally two diverging cardinal teeth in the right valve, with a single lateral groove on each side, while in the left valve there is usually one strong cardinal and no visible lateral, the edge of the shell fitting into the grooves of the opposite valve in such a way as to serve as teeth. From *Opisoma*, Stoliczka, they differ in having more cardinal teeth with the peculiar form of laterals on each side of the shell, instead of only on one side. Externally they somewhat resemble shells of the genus *Astarte* and also of *Nucula*, so much so that the cast of one of the Syrian shells was described by Conrad as *Nucula abrupta*, owing to a feature, which they all possess, of an abruptly truncated posterior slope, which in many is sharply flattened or even depressed between the umbonal angles, and the very ill-defined although large-sized lunule. The anterior margin of the shell is also smooth, not crenulated as in both *Opis* and *Crassatella*. For these species I propose the generic name *Platopis*, in reference to their flattened or depressed convex form as compared with *Opis* proper.

FIG. 1. FIG. 2. FIG. 3.

DESCRIPTION OF FIGURES.—Fig. 1, hinge, enlarged, of the left valve of *P. undata*=*Opis undata*, Conrad. Figs. 2 and 3, hinge, enlarged, of *P. obruta* =*Opis obruta*, Conrad.

PLATOPIS, new genus.

πλατυς flat, and *Opis* a genus of shells.

Small shells of triangular form, with an abruptly truncate or flattened posterior slope, and moderately incurved beaks. Hinge with diverging cardinal teeth, two in the right and one strong central tooth and two deep sockets with high bordering ridges in the left valve; right valve with lateral sockets, into which the edges of the left fit as teeth. Ligament slight, external; adductor muscular scars small; pallial line simple; margin not crenulate.

Types *P. undata* and *P. obrutus*, Conrad's sp.=*Opis undulata* and *O. obrutus*, Conrad, Off. Rept. Dead Sea, p. 222, Pl. 17, fig. 87, and p. 231, Pl. 2 App., fig. 9.

Platopis plicata, n. sp.

PLATE 5, FIGS. 13–15.

Shell below a medium size, transversely triangular in outline, somewhat cuneiform in a cardinal profile, very ventricose anteriorly and sharp behind; anterior end vertically truncate, the rather small sharply enrolled beaks even with the longest part of the shell below; basal line broadly curved, with a scarcely perceptible sulcation just in front of the postero-basal angle; cardinal line gradually and constantly declining from the beaks to the posterior angle; umbonal ridge angular, almost carinate, the cardinal slope between the ridges of the two valves being depressed, but appearing twisted by the curvature of the shell;

disc of the valves very gently depressed between the umbonal angulation and the anterior ventricosity. Surface of the shell marked by fine concentric lines of growth only; sometimes, however, gathered into faint ridges. Interior of right valve with the posterior cardinal tooth very much elongated posteriorly, while the anterior one is correspondingly small, and in the only example observed is only partially separated from the inner ridge of the anterior lateral groove; both anterior and posterior lateral grooves rather long.

This species differs from all the others described in the apparent twisting of the valves, in its cuneate form, as seen in a cardinal profile, with vertical anterior end and extremely ventricose rounded anterior part of the shell, and in being longer than high. From *O. obrutus*, Conrad sp., it differs in wanting the high and sharp beak, and from *O. acqualis* of the same author, both associated with it, in the short anterior end.

Locality.—In the Abeih sandstone at Ducûn, near Abeih, Syria.

Platopis? triangularis, n. sp.

PLATE 5, FIGS. 16 AND 17.

Shell rather small, almost equilaterally triangular in outline, the greatest antero-posterior length very little greater than the height; beaks central, slightly incurved and pointing anteriorly, not enrolled; postero-cardinal slope vertical, or very slightly depressed between the very angular posterior umbonal ridges; anterior end a little more rounded than the posterior, and the basal margin very regularly curved; disc of the valves very gently convex, and the surface marked by fine, rather even growth lines. Ligament quite small.

The equilaterally triangular form of this shell will readily distinguish it from any of those associated in this region, except *Mactra? olivensis* herein described, from which it may be distinguished by the less ventricosity, by the curving of the beaks, and by the angularity of the posterior-umbonal ridge. By this latter feature it may also be distinguished from *Astarte subcordata*, Conrad.

Locality.—In the brown clays and sandstones, at the Olive locality, near Abeih, Syria.

CRASSATILLIDÆ.

Genus SCAMBULA, *Conrad.*

Scambula secunda, n. sp.

PLATE 6, FIG. 1.

Shell small, irregularly trapezoidal in outline and very compressed, almost flat; beaks small, pointed, closely appressed, situated a little nearer the anterior than to the posterior end of the shell; anterior end rounded, gradually passing into the basal border, which is broadly and nearly regularly curved; posterior end truncate, very slightly emarginate near the middle; postero-cardinal margin concave or excavated between the beaks and the posterior end, the cardinal face, or escutcheon concave. Disc of the valves marked by a distinct umbonal ridge, and the postero-cardinal slope concave. Surface of the shell marked by concentric undulations, very much coarser on the posterior portions than on the anterior portions of the shell, strongly bent on the umbonal angle and retrally undulated as they cross the postero-cardinal slope. Besides the undulations, fine concentric striæ can be observed under a glass, which are independent of the undulations and cross them, showing that the undulations are not quite parallel to the margin of the shell. Interior unknown.

This species differs from *Scambula perplana*, Conrad, Pal. New Jersey, Vol. 1, Pl. 18, figs. 8-10, in being less prolonged and acuminate posteriorly, and in having much finer undulations. It is very interesting to find a second species of this genus of shells, although it differs so much specifically from the one found at the base of the New Jersey Cretaceous of this country, it is nevertheless very readily recognized externally as generically identical. There may be some slight doubt as to the true family relations of these shells, the specimens being small and so few in number, as well as a little obscure in their muscular markings, make it difficult to satisfactorily determine what their affinities are. The general form is so nearly like that of *Telledora*, *Pandora* and *Myodora*, that one naturally expects to see them classified near them. But they appear to be equivalve, and the American species, of which good interiors exist, show the crenulated border and other features, which would seem to ally them to the

Astarte and *Crassatella*, as well as do the features of the dentition.

Locality.—In the clayey seams of the Abeih sandstone, near Abeih, Syria. Somewhat rare.

GOULDIA, *C. B. Adams.* ERIPHYLA, *Gabb.*

Eriphyla cranulicosta, n. sp.

PLATE 6, FIGS. 2–5.

Shell small, greatest diameter scarcely exceeding 6 or 7 mm., triangularly elliptical in outline, with depressed convex valves, which are strongly marked externally by prominently elevated concentric ribs, and by finer radiating lines which can readily be seen by the unaided eye. The concentric undulations are abruptly bent near the posterior cardinal border, and thickened between that point and the margin, exactly imitating some of the West India species of *Chione* (*Omphaloclathrum*). Lunule large and deep, and the entire cardinal area deeply excavated. In the interior the ligamental pit beneath the beak is large and deep, the anterior margin of the hinge plate grooved in the right valve, and the posterior one on the left valve for the interlocking of the valves.

The shells of this species are so very like the group of *Chione* referred to above externally that if the interior had not been seen I should certainly have referred them to that group.

Locality.—In the clayey layers at Bewerty, about three miles west of Abeih, Syria, above the Abeih sandstone.

LUCINIDÆ.

Genus LUCINA, *Bruguiere.*

Lucina percancellata, n. sp.

PLATE 6, FIG. 6.

Shell quite small, scarcely exceeding 5 or 6 mm. in height, and but little longer than high; being nearly circular in outline and a little lower behind than in front of the beaks; beaks small nearest to the anterior end, surface of the valves depressed convex, marked by proportionally strong, radiating and concentric elevated striæ and ridges, the radiating lines more numerous

than the concentric ones, but of about equal strength, forming by their combination a very deeply cancellated surface structure, which extends over the entire shell.

The peculiar markings of the surface, together with the circular form, small size, erect and nearly central beaks, form the distinguishing features of the species.

Locality.—In the coarser part of the Abeih sandstone, at the Olive locality, near Abeih, Syria.

CARDIIDÆ.

Genus CARDIUM, *Linn.*

Cardium bellum, *Conrad*, Off. Rept. Lynch's Expl. Dead Sea, p. 225, App., Pl. 1, fig. 3.

Cardium Hillanum, var. *Moabitica*, Lartet, Geol. Palestine, Ann. des Sci. Geol. France, 1872, p. 53, Pl. 12, fig. 9.

Protocardium Moabitia, Noet., Zeitsch., 1886, p. 867, Pl. 27, fig. 3; Blanck., Biet. zur Geol. Syriens, 1890, p. 90.

There can be no question, I think, as to the identity of the specimens considered under the above citations of authors, and I can see no valid reason why Mr. Conrad's name, which was the first given, should not be accepted as that of the species. This same observation would as well apply to several other species as to the above, such as *Panoped orientalis*, and several others.

Cardium (Serripes?) Bewertense, n. sp.

PLATE 6, FIGS. 11–14.

Shell attaining a diameter of 5 cm. or over; subquadrangular in general outline, with moderately large, slightly incurved beaks, situated a little anterior to the middle of the shell; valves only moderately ventricose, the casts being depressed convex only; umbonal ridge subangular, with a flattened cardinal slope and almost squarely truncated posterior end. Surface of the shell marked only by fine concentric lines of growth. In the interior the hinge plate is rather narrow posteriorly, anteriorly it is very well developed, with a proportionally large antero-lateral tooth, the postero-lateral being distinct but not large. Cardinal teeth well developed. Muscular scars, as shown on internal casts of large size, but of moderate depth.

This shell resembles *Hemicardium Hillanum*, Sow., in its quadrate and nearly equilateral outline, but differs materially in being less ventricose, and entirely so in wanting the surface markings, there being only the fine concentric lines of growth.

Localities.—In the clayey limestone of the Bewerty beds, at Bewerty, preserving the shell in good condition; and as casts only at Naaman, about 5½ miles east of Aithath, Beyrut district, Syria. A single valve of smaller size, but having characters too similar to be separated from it, has been obtained from the Abeih sandstone at Duccûn, near Abeih.

Cardium (Protocardium?) Birdanum, n. sp.

PLATE 6, FIGS. 7–10.

Shell below a medum size, the largest one observed having a length of 27 mm. and of equal height, including the beaks, or 24 mm. from the base of the shell to the top of the hinge line; valves very ventricose, with large, prominent subcentral beaks which are strongly enrolled. Anterior end narrower than the opposite, rounding into the basal line; posterior end obliquely truncate, squarish on the postero-cardinal angle, the posterior slope slightly concave. Surface marked by very fine radiating lines, and on the posterior end and slope by somewhat coarser radii, which are more deeply marked; those on the anterior end and disc being scarcely impressed. Very fine microscopic transverse lines of growth cancellate the radii. Shell margin finely crenulated. The callosity in front of the beaks is proportionally quite large, very much elevated, and when the valves are united presents a nearly circular outline.

This shell resembles *C. subhillanum*, Leym., as figured by d'Orb., Terr. Cret., Pl. 239, figs. 7 and 8, except in the angularity and truncation of the posterior end; the French shell being rounded or subcircular. Leymerie, in the original description and figure (Mem. de la Soc. Geol. France, Vol. 5, p. 5, Pl. 7, fig. 2), gives nothing of the truncation of the anal end, or of the stronger striæ on this part of his shell. Consequently I can only conclude this to be a very distinct species.

Locality.—Common in the Abeih sandstone at Duccûn, near Abeih, Syria.

ISOCARDIIDÆ.

Genus TRAPEZIUM, *Humph.*

= *Trapezium*, Mulhf. not Blainvl. *Cypricardia*, Lamk.

Trapezium Naamanense, n. sp.

PLATE 6, FIGS. 15 AND 16.

Shell small, none of those observed reaching more than 12 mm. in length, elongate trapezoidal in outline, with proportionally large enrolled beaks, situated at about the anterior third of the length; cardinal and basal angles parallel, the body of the valves appearing almost cylindrical in front of the very sharp, carinate umbonal angle, or in some cases showing a slight sulcus between the ridge and the anterior end; anterior end sharply rounded, and the posterior end obliquely rounded; posterior cardinal slope abrupt and the surface concave. Surface of the casts, the condition in which they occur, showing indications of radiating striæ, sometimes quite strong.

A small, but very neat and distinct species, found also in large numbers, the cylindrico-trapezoidal form with the small size will readily distinguish the species from any of those with which it is associated. It is as nearly like *Arca fabiformis*, Con., Lynch's Dead Sea, Pl. 17, fig. 97, as any one of the series, but is far more cylindrical, and longer anteriorly, and not so high proportionally.

Locality.—As casts, retaining the external form and surface markings, quite frequently in the light ash-colored calcareous clays at Naaman, 5 to 6 miles east of Aithath, in beds resting above the brown gasteropod clays, Beyrût district, Syria.

? CYPRINIDÆ.

Genus VELEDA, *Conrad.*

Veleda elliptica, n. sp.

PLATE 7, FIGS. 1 AND 2.

Shell small, 20 to 25 mm. in length, transversely subelliptical in outline, the beaks breaking the elliptical outline on the cardinal border by projecting a little beyond the regular line. Valves very depressed convex on the disc, and strongly incurved

at the postero-cardinal margins; beaks small, slightly pointed, situated a little in advance of the centre and directed anteriorly; anterior end scarcely narrower than the posterior; lunular area very slightly impressed on the larger specimens, while the posterior cardinal border are strongly inflected; ligament short, situated close to the beaks. Surface marked by proportionally strong concentric lines of growth, strongest on the posterior end of the valves.

These shells are small, and like the American types of the genus, rather obscure, although very *Tellina*-like in their general features; they are, however, equivalve, want the twist of the valves of *Tellina* and the posterior sulcation common in that genus.

Locality.—In the Abeih sandstone, at the olive locality, just below Abeih, Syria.

Corbicula (Batissa?) Hamlini, n. sp.

PLATE 6, FIGS. 17–22.

Shell transversely subelliptical, oval or subquadrate in outline, the latter form being the most common. In size varying from 25 to 30 mm. long, and moderately ventricose, with rather strong but not prominent beaks, directed anteriorly and generally situated at about the anterior third of the length, but often nearer the anterior end; sometimes the posterior end is subtruncate and the umbonal ridge perceptible. No lunule visible, and the ligamental depression is narrow and frequently indistinct. Surface of the shell marked by strong concentric lines of growth only.

In the interior the hinge is corbiculoid, the right valve has two subequal cardinal teeth only, near each other, and directly beneath the beak; a long lateral groove occurs on each side; left valve with two cardinal teeth, the anterior very thin, the posterior thickened; antero-lateral long and slender, postero-lateral apparently formed by the margin of the valve only; muscular scars large, submarginal and remote; pallial line not observed. This species differs from *Gonodon? hebes*, Hamlin, Mem. Mus. Comp. Zoöl., Vol. 10, p. 52, Pl. 4, figs. 1*a* to *c.*, which it most nearly resembles of any in this district, in being a smaller

shell, much less ventricose, with very much smaller and less central beaks, and entirely so in the hinge structure. It somewhat resembles *Astarte arctata*, Conrad, Off. Rept. Dead Sea, p. 215, Pl. 20, fig. 119, in general outline, but has the beaks directed more anteriorly, and the profile given by that author is altogether different from what this shell would give. Cardium? sp., also of that author, loc. cite., p. 217, Pl. 15, fig. 76, somewhat resembles it, but is more equilateral.

The shell is doubtless a *Corbiculoid*, and near *Batissa*, Gray, but differs in having only two instead of three cardinal teeth in each valve, otherwise it agrees very well. It also comes near the genus *Isodoma*, Desh., a Tertiary shell, but the cardinal teeth are not bifid and are less divergent, so I have chosen to place it provisionally under *Batissa*.

Locality.—The shell appears to be abundant at Duccûn, near Abeih, Syria, in the coarser layers of the Abeih sandstone, the grains of sand have entirely obliterated the pallial line, so it is not observable. There is also a single internal cast, apparently of the same shell, from Marahh, Syria, in the yellowish-brown clays of the Bewerty beds.

CYRENIDÆ.

CORBICULOPSIS, new genus.

Corbicula, a genus of shells, and ὄψις appearance.

Shell transversely quadrate, with appressed beaks anteriorly placed, valves with angular umbonal ridge, and concentrically marked. Hinge but slightly arcuate, three small cardinal teeth in each valve, the posterior one largest; antero-lateral tooth short, large, transverse, placed near the cardinals; posterior-lateral distant, elongate, leaving a flattened space in front. Ligament external, slight. Muscular imprints and pallial line yet unknown.

The shells for which the above name is proposed are transversely elongated and concentrically striated, having an angular umbonal ridge, and presenting much the appearance of shells like *Tapes* (*Parembola*) *litterata*, Linn., but somewhat more angular on the umbonal ridge. The hinge, however, which forms nearly a straight line, has the elements of that of *Corbicula*

somewhat subdued. Among the genera of fossil forms perhaps *Leptesthes*, Meek, proposed for a group of Laramie shells, is the nearest, but externally are quite unlike, while the hinge teeth are far more *Corbicula*-like in size and arrangement than are those of the Syrian forms; so much unlike that it is difficult to consider them as generically similar.

Corbiculopsis Birdi, n. sp.

PLATE 7, FIGS. 3–7.

Shell attaining a length of from 5 to 6 cm., with a height of rather more than 3 cm., cardinal and basal borders subparallel, widening somewhat posteriorly; anterior end less than one-third of the entire length, rounded; posterior end obliquely truncate, slightly rounded on the margin; the basal line is slightly rounded in shells of young or medium growth, but in the older specimens becomes very slightly emarginate just anterior to the middle of the shell's length; beaks small, appressed; umbonal ridge subangular, and the posterior slope sometimes very slightly concave. Surface of the shell marked by moderately strong concentric lines of growth only.

This shell presents exactly the form and proportions of *Unio complanatus* of the eastern American rivers, or very nearly that of *Tapes litterata*, Linn., among the marine forms, and is peculiar among Cretaceous bivalve shells in this character. It is possibly the form identified by Dr. Frass as *Venus Royana*, d'Orb., from which it differs generically.

Locality.—This species is common in the coarser layers of the Abeih sandstones at Duccûn, near Abeih, Syria.

VENERIDÆ.

Genus ARCOPAGIA, *Leach.*

Arcopagia planissima, n. sp.

PLATE 7, FIGS. 8 AND 9.

Shell rather large, transversely broad-oval, very compressed inequivalved and slightly twisted or bent, the right valve the most convex; beaks a little anterior to the middle, and judging from

the internal casts alone they appear to have been quite compressed and inconspicuous; the groove left by the hinge plate between the two valves, on the casts, is quite marked, and the pit between the beaks from the thickening of the hinge-plate below the cardinal teeth quite distinct. Muscular scars distinct and of moderate size; pallial line not discernable.

This species differs from *A. depressa*, Coq. ("Pal. Constantine," Pl. 6, figs. 8 and 9), in being much more circular in outline. In this respect it closely resembles the form described by Conrad, from the New Jersey Cretaceous Marls, as *Cyprimeria depressa* (see Pal. N. J., Vol. 1, Pl. 22, figs. 11-13), but the posterior slope has been much narrower.

Locality.—In the brown clays above the Abeih sandstone, at Shimlan, Syria.

Genus CARYATES, *Roemer.*

Caryates globulus, n. sp.

PLATE 7, FIGS. 10 AND 11.

Shell below a medium size, globular in form when not distorted; the rather strong beaks being subcentral and directed anteriorly, but not remarkably so. Ligament small, but distinct. Surface marked only by concentric lines of growth, but these are rather strong, very distinctly marked and often gathered into indistinct groups.

The distinctly globular form of this shell, together with the moderately strong subcentral beaks, will serve to distinguish it from any of the associated species. I have not seen the interior of the hinge, but there can be but little doubt of its generic relations. Shells of this group have often been referred to the genus *Thetis*, Sow., by many authors, but if the small triangular shells, like those usually referred to *Gouldia*, C. B. Adams, are to be considered as characteristic of that genus, as is done by many good authorities, these certainly cannot be arranged with them.

Locality.—Not uncommon in the Abeih sandstone at Duccûn and the Olive locality near Abeih, Syria.

Genus CALLISTA, *Poli.*

Callista Syriaca, n. sp.

PLATE 7, FIGS. 14 AND 15.

Shell of medium size, the largest example of an internal cast measuring 4½ cm. in length by a height of nearly 3 cm. at the beaks, the thickness being about 12 mm. General outline elliptical, with small beaks directed anteriorly, and situated at about two-thirds of the length from the anterior end. Anterior end with the cardinal border rather deeply excavated in front of the beaks, and the extremity sharply rounded; basal line regularly curved; posterior end less sharply curved than the anterior; posterior cardinal margin gently arcuate from the beaks to the posterior end. Muscular imprints on the casts rather indistinct; pallial sinus sharp and pointed toward the beaks. In a cardinal profile view the form of the cast is narrowly elliptical with approximate appressed beaks.

These casts somewhat resemble that of *Venus Reynesi*, H. Coquand, Pal. Constantine, Pl. 7, figs. 11 and 12, but is more elongate with much less elevated beaks and a less thickness through the valves.

Locality.—In the light ash-colored clays at Naaman, Syria. Not uncommon.

TELLINIDÆ.

Genus DONAX, *Linn.*

Donax minutissimus, n. sp.

PLATE 7, FIGS. 12 AND 13.

Shell almost minute, cuneiform, thick at the anterior end and narrowing posteriorly both in height and thickness; nearly two-thirds as high at the beaks as the entire length. Anterior end very short and gently curved, the anterior slope rather abrupt and the basal line very gently arcuate; posterior end narrowly rounded; beaks small and closely incurved, close to the anterior end. Surface apparently finely striated. Length about one-fourth of an inch.

Apparently a true *Donax*, and remarkable only for its small size.

Locality.—In the Abeih sandstone at the Olive locality near Abeih, Syria.

MACTRIDÆ.

Genus MACTRA, *Linn.*

Mactra? Olivensis, n. sp.

PLATE 7, FIGS. 16 AND 17.

Shell small, triangular; height and length about equal; very ventricose with small, subcentral approximate beaks, scarcely curved anteriorly; anterior end of the shell a trifle the longest, and the posterior very slightly truncated vertically; basal line regularly curved. Surface of the shell under a magnifier sometimes showing faint radiating lines, which seem almost as if due partly to a form of exfoliation, as it does not appear on all examples.

I am not certain that this shell ought to be placed under *Mactra*, although there is but the one external feature that does not agree well with the characters of that genus, viz., the apparent striated surface. I have not seen the interior, consequently cannot feel sure.

Locality.—In the clayey layers of the Abeih sandstone at Olive, near Abeih, Syria.

ANATINIDÆ.

Genus ANATINA, *Lamarck.*

Anatina? orientalis, n. sp.

PLATE 7, FIG. 18.

Shell of medium size, transversely ovate, with nearly central, somewhat prominent, erect beaks, situated nearest to the anterior end. Valves broadest anterior to the beaks and narrowed posteriorly; wide end almost vertically truncate, longest above the middle; narrow end more sharply rounded. Substance of the shell very thin and fragile, and the surface beautifully and evenly marked with fine concentric lines, scarcely visible except by the aid of a lens.

I am by no means certain that this is a true *Anatina*, as I have not seen anything of the hinge, but the form of the valves and

general character of the shell lead me to believe it most nearly related to this group. A smaller individual than that figured would indicate that the shell in its younger stages was more distinctly rounded at each extremity than when more fully grown.

Locality.—At Shweifat, in the Beyrût district, Syria, in rocks which are equivalent to the chalks of Andrifil, which are about the highest of the Cretaceous rocks of the Beyrût district.

CORBULIDÆ.

Genus CORBULA, *Burguiere.*

Corbula olivæ, n. sp.

PLATE 7, FIGS. 19–21.

Shell of medium size, one fragment of a right valve giving positive evidence of a length of 12 mm.; a smaller but perfect shell, exceeds one centimetre very slightly, with a height of right valve of 8 mm., and a thickness of the two valves, in place, of 6 mm. Right valve very ventricose, subtrapezoidal; beak large and enrolled, overhanging the hinge line, terminal anteriorly; posterior end caudate on the line of the hinge, which is straight; anterior end truncate, abrupt, impressed below the beaks; disc of the valve with strong, rounded, concentric undulations, extending anteriorly and posteriorly. Right valve small, convex, destitute of concentric furrows, but with several obscure radii on an otherwise smooth surface; anterior umbonal ridge strongly marked.

The peculiar trapezoidal form of the right valve, coupled with its strong, rounded, concentric undulations and the faint raised radiating lines of the smaller valve will distinguish this species. The right valve is heavy and dense, and the hinge is marked by a strong tooth and a very deep pit, which extends beneath the large enrolled beak. The left valve has not been obtained separated.

Locality.—In the Abeih sandstone at the Olive locality, near Abeih, Syria.

GASTEROPODA.

TURBINELLIDÆ.

Genus CARICELLA, *Conrad.*

Caricella planilirata, n. sp.

PLATE 8, FIGS. 1 AND 2.

Shell rather above the medium size, the type used being about 7½ cm. in length ; obovate in general outline, the upper portion of the body whorl being somewhat inflated ventricose. Volutions, five or more, angularly rounded on the upper face, the exposed part of each, above the body whorl, forming nearly or quite a quarter section of a circle, as seen in profile. Body whorl proportionally large, forming on the apertural face, about four-fifths of the entire length, while the aperture, which is elongate semilunar in outline, forms a little more than three-fourths of the entire length. Surface of the shell, as shown on the cast, marked by broad, low convex, spiral bands, and on the shoulder of the last volution, a little below the suture, by a depressed concave groove. Substance of the shell apparently thin. Columella somewhat curved, and so far as can be ascertained from the type specimens, shows no evidence of folds.

The shell may possibly not be a true *Caricella*, owing to the apparent absence of folds on the columella, still they may have existed, as the specimen is in a hard compact limestone which does not readily separate, and I have but the one very imperfect specimen. If it should not possess the folds it would then naturally fall under the genus *Ficus*, Ross, but the surface has not been cancellated, and the general resemblance is like *Caricella.*

Locality.—In limestone between Shimlan and Aitath, north of Abeih, Syria, above the Bewerty clays.

VOLUTIDÆ.

Genus VOLUTOMORPHA, *Gabb.*

Volutomorpha? orientalis, n. sp.

PLATE 8, FIGS. 3 AND 4.

Shell rather small, the largest individual being only two and a half centimeters long, with the three upper volutions absent.

Spire very much elevated, the volutions being rather high between sutures, and more than moderately convex; the last one when measured on the back forming nearly one-half of the entire length of the shell, making the aperture correspondingly long. Surface smooth or marked only by fine lines of growth.

This species is much like *V. bella*, Gabb, from the Cretaceous marls of New Jersey, U. S., but has different proportions from any of those recognized, and does not show any vertical folds or other sculpturing, and I have no positive evidence of any fold on the columella, so it is possible it may not belong to this group.

Locality.—In the Abeih sandstone at Duccûn, Syria.

PLEUROTOMIDÆ.

Genus MANGELIA, *Leach.*

Mangelia? solitaria, n. sp.

PLATE 8, FIGS. 5 AND 6.

Shell small, measuring only 12 to 15 mm. in length, with a very slender, elevated and turriculated spire, composed of eight or more volutions, which are slightly shouldered or chamfered at the upper margin, the general form of the volutions being slightly convex between sutures. The last volution, as measured on the front side equals one-half of the entire length of the shell, the aperture alone being rather more than one-third. Aperture narrowly oblique, prolonged slightly to form the short, narrow, twisted canal, and the outer lip distinctly notched close to the suture. Inner lip not callus or coated. Surface of the shell marked by a few raised, spiral lines most conspicuous on the base of the volution.

The absence of a callus on the inner lip on this shell renders its correct reference to *Mangelia* somewhat doubtful, but its other features make it fully as difficult to place in any other division of the *Pleurotomidæ*, while the very decided slit in the aperture shows it to belong unquestionably in this group.

The figure given on block fig. 1, letter *a*, at the base of figure in centre of Pl. 6, Blanckenhorn, Betrag. zur Geol. Syriens, referred to *Nerinea minima*, is very similar to specimens of this shell, but these are certainly not *Nerinea*.

Locality.—In the brown clays near the top of Gazelle Mt., near Abeih, Syria.

STROMBIDÆ.

Genus STROMBUS, *Linn.*

Strombus? crassaliratus, n. sp.

PLATE 8, FIG. 7.

Shell large, the internal cast being about 11 cm. in length, and represent only the parts within the expansion of the outer lip, indicating a large and somewhat ponderous shell, having a narrow conical form, with a very short convex spire, the inner whorls of which are more slender and are more elevated than the outer ones, which are rounded between the sutures. Surface of the cast marked by very coarse spiral ribs or ridges, which on the back of the cast are more than one-fourth of an inch in width, and number about ten or eleven on the shell below the angle of the volution.

This cast is so distinct and remarkable that, although showing but few of the specific features, I have thought it desirable to present it as a member of the Syrian Cretaceous fauna. The strong lirations will readily distinguish it when coupled with its cone-like outline. The specimens referred to *S. Mermeti*, Coq., Geol. et Palæont. de la Constantine, Pl. 5, fig. 2, is so much shorter and less conical, that it will not be easily confounded with this.

Locality.—Between Shimlan and Aitath, north of Abeih, Syria, in brown clay-limestones above the Bewerty clays.

Aporrhais pleurotomoides, *Blanck.*, Betrag. zur Geol. Syriens, p. 115, Pl. 9, figs. 8–10.

From a number of specimens of this species it is shown to belong to the *Pleurotomidæ*, and probably to the section *Drillia*. The shell possesses a peculiar feature in having a strong varix half a turn back of the true aperture, representing a previous lip margin at that point, in all of the adult specimens. This feature is partially shown on Dr. Blanckenhorn's fig. 9.

Alaria monodactyla, *Hamlin*, Mem. Mus. Comp. Zoöl. X, p. 28, Pl. 2, figs. 6, *a–c*.

Specimens representing this species from Bewerty show it to be entirely a distinct species, having no relations with *Turritella* (*Cerithium*) *magnicostata*, Conrad, as cited by Dr. Blanckenhorn, loc. cite., p. 111. The undetermined casts figured by Hamlin as fig. 9 *a*, *b*, are probably of this same species.

NATICIDÆ.

Natica (Gyrodes) orientalis, *Conrad*, Off. Rept. Lynch, Expl. Dead Sea, p. 233, Pl. 5, app. fig. 41.

Amauropsis abeihensis (*Hamlin*), Blanckenhorn, Beit. zur. Geol. Syriens, p. 103.

A number of casts of this species shows it to have the top of the volutions flattened as is usual in the group referred to *Gyrodes*, and to be entirely distinct from *Amauropsis abeihensis*, Hamlin, as given by Blanckenhorn, p. 103 of his report. Conrad's specific name should therefore be retained under the genus *Gyrodes*.

Genus AMPULLINA, *Lamarck*.

Natica (Ampullina) fluctuoides, n. sp.

PLATE 8, FIGS. 8–10, AND PLATE 9, FIGS. 1 AND 2, VARIETY.

Shell of only a medium size, the largest individual observed scarcely exceeding two centimeters in its greatest diameter, which is across the aperture nearly at right angles to the inner line of the columellar lip. The outline form, as viewed on the plane of the aperture, is a broad oval, the two diameters of which are as five to six; and the height of the back of the shell, when resting upon the aperture, is equal to two-thirds of the short diameter of the oval. Whorls three to four, the last one forming almost the entire bulk of the shell, the inner whorls being nearly concealed, and the suture lines very obscure. Columellar lip covered by a smooth callus, the lower part of the lip thickened, and the outer margin thin and sharp. The entire form of the shell is, in fact, almost a minature of *A. fluctuata*, Sowerby, the living type of *Ampullina*, but the spire is even less prominent, and the callus a

little more limited, not spreading so far down on the columella. Surface of the shell smooth, except very fine, even, transverse lines of growth, and on the greater number of the specimens there are fine dark brown or blackish color lines, parallel to the lines of growth, but often interrupted in irregular patches or blotches, and also appearing darker in patches, but always interrupted at the margin of the callus. These probably represent original color lines existing on the shell during life.

The shell is so exactly similar to *N.* (*Ampullina*) *fluctuata*, Sowerby, that there can be no question as to their generic relations, if it were only possible to tell which of the several names applied by different authors to that shell were the right one to use as a generic appellation ; but this seems to be a question not easily decided, therefore I have selected *Ampullina* as the one most commonly used.

Locality.—In the yellowish brown clays at Bewerty, near Abeih, Syria ; and a single specimen from a darker brown layer at the Olive locality, near the same place. There are also twenty-six specimens in the collection from this last locality, which present the same features specifically, but are all of smaller size, the largest being less than a centimeter in its greatest diameter. They have the appearance of mature shells, and I am inclined to consider them more as dwarfed specimens than as representatives of a distinct species.

Ampullina fluctuoides, var., **acuminate,** new var. Pl. 9, figs. 1 and 2.—A single specimen presenting many of the features of the above species comes from the chert beds of Gazelle Mt., near Abeih. It is smaller in size, but may not be mature, but the spire is quite pointed as compared with that of *fluctuoides*, and coming from a somewhat higher geological horizon I am inclined to think it may represent a distinct species. Having but a single individual, however, I have indicated it as a variety provisionally.

Natica (Ampullina) minima, n. sp.

PLATE 9, FIGS. 5 AND 6.

Shell small, the largest of ten specimens measuring about eight mm. in its greatest diameter when resting on its aperture ; form

in outline, ovate, the apertural border widest; last volution forming almost the entire visible portion of the shell, the spire being nearly enveloped within it. Aperture proportionally large, semilunate in form, and the columellar lip coated by a thick heavy callus, which spreads down and upon the lower lip of the aperture as in *A. fluctuate*, Sowerby.

This species differs from *A. fluctuoides* herein described, in being smaller and less symmetrically oval in outline, but principally in its color markings, which consist of two narrow spiral bands of brown, one of which occupies the middle of the volution, and the other occurring midway between that and the base of the shell; these bands are made up of transverse colored lines parallel to the lines of growth; on the space above the upper band there are irregular zigzag lines, and between the two bands other narrow tortuous lines of the same color, the whole coloration very well representing that on a two-banded specimen of *Natica canrena* of the present seas.

Locality.—In the brown calcareous clays near the summit of Gazelle Mt., near Abeih, Syria. The horizon of this shell is much above that of *A. fluctuoides*.

Genus NEVERITA, *Rissoa*.

Neverita patula, n. sp.

PLATE 9, FIGS. 3 AND 4.

Shell small, the greatest diameter of the only two individuals examined, being twelve and thirteen mm. respectively, while the vertical height is about eight mm. Volutions between three and four, very rapidly increasing in size; spire low, or depressed convex, but with distinct sutures, the inner coils rising but little above the outer one. Aperture proportionally large and patulose, the upper margin of the lip very much in advance of the lower portion, the whole being thin and sharp except between the base and the umbilicus. Umbilicus entirely covered by a large, thick and heavy callus, the lower portion of which is slightly depressed below the level of the adjacent volution, and the columellar face marked by a deep, strongly marked transverse groove, which reaches more than half way across the callus. Surface of the

shell marked by distinct transverse growth lines parallel to the lip, and also by proportionally large lozenge-shaped light colored patches on a dark ground, which forms a distinct net work, the long axis of the lozenges are arranged transversely.

The depressed form, large aperture, heavy callus with its deep groove, are distinguishing features, while the color markings, which are evidently life features, are remarkable.

Locality.—In the Abeih sandstone at Duccûn, near Abeih, Syria.

Natica? (Amauropsis) scalaris, Conrad's sp.

Natica scalaris, Conrad, Off. Rept. Dead Sea, App. p. 234, Pl. 7, fig. 50.

? *Amauropsis subcanaliculata*, and *gradata* (Hamlin), Blanckenhorn, Betrag. zur Geol. Syriens, p. 102.

? *Chenopus induratus*, Con. Off. Rept. Dead Sea, p. 220, Pl. 11, fig. 69.

I am not at all sure that the two forms described by Hamlin under the names above cited are the same as the *Natica scalaris*, Conrad, as stated by Blanckenhorn. If they are, then Conrad's *Chenopus induratus* must certainly follow. The short spired form given by Hamlin as *A. gradata*, I think may well be included under Conrad's name, but why Conrad's specific name should be suppressed after removal to a genus under which there is no species *scalaris*, I don't quite understand. Conrad's shell is well figured, and retains the shell substance, and is fairly described as descriptions were given at the time, and I think should hold. We possess in our collection several specimens of various sizes of the form given by Conrad, two of them larger and more thickened even than Conrad's specimen. On them the shell substance is very thick, in parts six or seven mm. The constriction on the body whorl is sometimes very deep, and the surface of the shell gathered into vertical folds parallel to the margin, while the upper angle of the inner volutions is frequently strongly nodose. The columellar lip is much thickened and callus, but is never umbillicate. The internal casts of young specimens is shorter than the common form of *A. gradata*, Haml., and strongly umbillicated. I consider *Amauropsis sub-canalicutata*, Hamlin, as quite distinct from Conrad's species.

Amauropsis abeihensis, *Hamlin,* Mem. Mus. Comp. Zoöl. Vol. X, p. 17, Pl. 1, fig. 2.

I have what I suppose to be this species from the Abeih sandstone at Abeih, Olive, Klelay and Duccûn, about thirty-five specimens in all. I find that the spire is generally much more elevated than in the one figured by Mr. Hamlin, sometimes very much more, in which case the sutures are not so deep. The form is generally very erect, the columella being almost vertical, and the callus slight, while as a prevailing feature there is a slight umbilical perforation. The fissuring of the columellar lip mentioned by the author occurs in only three of the specimens, and is apparently an accidental feature caused by a duplication of the columella within the umbilicus, while it is continuous below, resembling a varix somewhat.

SCALARIDÆ.

Genus SCALARIA, *Lamarck.*

Scalaria Bewertensis, n. sp.

PLATE 9, FIGS. 8 AND 9.

Shell small, the longest individual recognized measuring 14 mm. has contained about twelve volutions, and presents an apical angle of fourteen or fifteen degrees. Another individual with a length of less than 13 mm. presents an apical angle of about twenty degrees. This last is marked by eight longitudinal varices, while the more slender one has fourteen. The volutions are short and moderately convex between sutures, and the terminal one has two spiral carina below the varices, the upper one of which interrupts them, the other being situated very close to it. Aperture nearly round; the outer lip being imperfect in both examples figured fails to give the entire features of the mouth; axis imperforate. The varices are sharply elevated, and are slightly bowed backward in the middle in crossing each volution, but are so aligned with those above and below as to present a continuous line with a spiral direction of about one-sixth of a turn in the length of the shell on the shorter of the specimens. The other is less regular.

It is possible these shells may be the representatives of two distinct species, but in the absence of other individuals I have considered them only as variations of a single one.

Locality.—Found in the yellow clays above the Abeih sandstone, at Bewerty, near Abeih, Syria.

Scalaria novemvaricosa, n. sp.

PLATE 9, FIG. 7.

Shell of medium size, consisting of from eight to ten volutions, and having an apical angle of a little more than twenty degrees. Volutions very ventricose between the strongly-marked sutures, and crossed by nine strong, elevated, rounded, longitudinal varices, which form rigid vertical lines along the shell. Base of the last volution thickened; bordered at the lower sutural line by a thickened, elevated, spiral line, interrupting the longitudinal varices. Aperture ovate, longer than wide, slightly rimate below. Outer lip thickened by one of the varices. Surface of the entire shell marked by very fine spiral lines, which cross the varices and intermediate surfaces with equal strength, but of so fine a texture as to be invisible except by the aid of a lens; and when examined by a strong glass these are seen to be crossed by still finer vertical lines of growth, which give a crenulated feature to the spiral lines.

This shell differs from *S. Bewertensis*, herein described, in the strength and nature of the varices, and in the more convex volutions, the varices not being spirally arranged. From *Chemnitzia, Syriaca*, Frass, Aus dem Orient., Vol. 1, Pl. 1, fig. 4, which it somewhat resembles, it may be distinguished by the more ventricose volutions, smaller number of varices, and fine surface features.

Locality.—In the Abeih sandstone, at the Olive locality, near Abeih, Syria.

TURRITELLIDÆ.

Turritella peralveata, *Conrad*, Off. Rept. Dead Sea, p. 221, Pl. 20, fig. 120.

Eunema? bicarinata, Hamlin, Mem. Mus. Comp. Zoöl. X, p. 24, Pl. 2, fig. 5.

Glauconia Trechi, Blanckenhorn, Beitrage zur Geol. Syriens, p. 101, Pl. 7, fig. 16 (10).

Comp. *Turitella Seetzeni*, Lartet., Geol. de la Palestine, p. 43, Pl. 9, fig. 9.

Comp. *T.*—(*Glauconia*) *geibeli* (Zek. sp.), Blancken., loc. cite., p. 100, Pl. 7, fig. 13.

This is one of the most variable species in the entire collection, varying from thirty to forty-three degrees in its apical angle in different individuals, and from those that are perfectly smooth to some much more deeply grooved, or strongly carinate than that figured by Mr. Hamlin as *Eunema? bicarinata.* I have not found any, however, with more than two "*strong carinea*" on the exposed part of the whorls between sutures, though they often show one and sometimes two minor carina, one above and the other below the principal ones. It would be a very easy matter to make three distinct species if one had only the three extreme forms, but with a suit of forty to fifty specimens it is very easy to unite them into a single one. In the smoother forms the volutions are often strongly carinate just above the suture, usually on the upper three, and again on the last one, with the intermediate ones straight between sutures. The apertural half is again often contracted, giving a pupa-like form to the shell entirely unlike the normal form. This feature I have only seen on the smooth and on the semicarinate ones, while a few of the strongly carinate specimens have the last volution unusually enlarged. Dr. Blackenhorn seems to accept Hamlin's *Eunema bicarinata*, but cites Conrad's *T. peralveata* as a synonym of *T. ventricosa*, Forbes, with two question marks, which I think are more than fully required when one examines the original figures. He also recognizes *Turritella Seetzeni* of Lartet, referring it to the genus *Glauconia*, and describes a new species *G. Frechi* from a specimen which is quite typical of *Eunema bicarinata*, Hamlin, and which is also a very good representative of Conrad's figures of *Turritella peralveata.* From the study of this large group of specimens from near and around Abeih, I should consider all the above mentioned forms as of one single species, *Turritella peralveata*, Conrad, which was the first of the names given, and I think must be retained. Among the specimens of this set in our col-

lection there are also individuals which I am forced to include under the same name, because all the connecting links are seen which also fully represent Dr. Blanckenhorn's figure 13, of Plate 7, which he identifies as *Glauconia geibeli*, Zek. sp., which is intermediate between the ordinary *T. peralveata* and the smooth species above mentioned.

Genus MESALIA, *Gray.*

Mesalia gazellensis, n. sp.

PLATE 9, FIG. 10.

Shell small, seldom exceeding 12 mm. in length, and composed of eight or more volutions. Apical angle about fifteen degrees, but varying in different specimens to above or below this angle. Volutions very ventricose, the tube being circular in section, and the shell of nearly equal thickness, giving the outside of the volution about all the roundness possible, with deeply marked sutures. Aperture round, except for the slight extension of the columella in front; axis imperforate; surface smooth, or with faint indications of spiral lines.

Locality.—In the brown clays near the summit of the Gazelle Mt., near Abeih, Syria.

Genus TUBULOSTIUM, *Stoliczka.*

Tubulostium? rugosum, n. sp.

PLATE 9, FIGS. 15 AND 16.

Shell discoid, consisting of three or more whorls, which are coiled nearly on the same plane, and the outer whorls slightly embracing the inner on their ventral edge. Tube quadrangular externally and laterally flattened, making the dorso-ventral diameter somewhat greater than the lateral diameter, while the dorsum may be convex, flattened or concave as seen in different individuals. The surface of the tube is marked with longitudinal raised lines and transverse undulations, the latter becoming strongly developed and rugose, or even subspinose on the dorsal parts of the outer volution.

This species closely resembles the type species of *Tabulostium, T. discoideum*, Stoliczka, Pal. Indica Vol. II, p. 240, Pl. 18, figs.

20–25, in its general appearance except for the rugose character of the surface markings. I have not seen the tubular aperture, however, nor the spiral nucleus, as none of the specimens are perfect enough to show these features if they ever existed, nor can I distinguish more than two layers of shell matter in a cross section, so that I am not positive of its generic relations, and it may prove to be an annelid resembling *Spirula*.

Locality.—In the yellowish brown clays at Bewerty, near Abeih, Syria.

Family PYRAMIDELLIDÆ.

ODOSTOMOPSIS, new genus.

From *Odostomia*, a genus of shells and ὄψις, appearance.

PLATE 9, FIGS. 13 AND 14.

Shell univalve, naticoid in form, axis perforate, peristome interrupted, columella with a single strong fold or plication at the upper end near the body whorl; surface smooth, substance thick. Type *Phasianella abeihensis*, Blanckenhorn.

The above name is proposed for the shell described by Dr. Blanckenhorn as *Phasianella abeihensis*, and figured on his Pl. 7, fig. 4. The general form would be that of *Phasianella* were it not that the columella is straightened; has a large, strong fold, and that the axis is perforate. Dr. Blanckenhorn has described a second specimen of the same species under the name *Pyramidella amœna* at page 105, Pl. 7, fig. 21. The general form when entire is very like *Amauropsis*, but the fold on the columella entirely removes it from that group, and will ally it with the *Pyramidellidæ*.

Obeliscus bilineatum, Conrad's sp.

Cerithium bilineatum, Conrad. Off. Rept. Dead Sea, &c., p. 233, App. Pl. 5, fig. 39.

Phasianella sp. (Lartet), Blanckenhorn, Beit. zur Geol. Syriens, p. 97.

This species I think is unquestionably an *Obeliscus* or very closely allied to that genus. See notes on this species under *Cerithium bilineatum* on page 428.

Genus NERINEA, *DeFrance.*

Nerinea species.

There are several distinct species of this genus in the collections studied, and among them some that are very variable at different stages of growth, but still more diverse in character when seen in different conditions of preservation. Mr. Conrad described six species from Syria, which he referred to this genus, one of which, however, *N. abbreviata*, Off. Rept. App., Pl. 5, fig. 36, is an *Actaconoid* shell, *Triptycha abbreviata.* Another, *N. orientalis*, Pl. 5, fig. 32, App. Offic. Rept., is a *Cerithium*, so that but four species are left of the six, as follows :

N. Syriaca, Conrad, Pl. 12, fig. 72.—This figure is accepted by Dr. Blackenhorn as the true *N. Syriaca*, and there is no question whatever as to his *N. Berytensis* being a section of the shell of the species of which Conrad's figure represents the internal cast.

N. Bhamdunensis, Conrad, Pl. 22, fig. 128 (by error in some copies 132)=*N. minima*, Blanckenhorn, Pl. 6, figs. 1 *a* and 2 *f*.

N. cochleæformis, Con., Pl. 4, App., fig. 29.—This has been identified by Lartet, Frass and Blanckenhorn as *N. gimmifera*, Coquand, which is, however, quite a differently ornamented shell, lacking the two lines of nodes in the depressions between the ridges, in which Conrad's shell much more closely resembles *N. monilifera*, D'Orb. It was also redescribed by Hamlin as *N. pauxilla.* All these names are subsequent to Conrad's, and must be discarded.

N. cretacea, Conrad, Pl. 16, fig. 25.—This may possibly be the same as *N. Schicki,* Frass, as cited by Blanckenhorn, although I cannot well see the identity; still, as Conrad's name has priority by about fifteen years, and was much better figured, it must hold if identical.

Mr. Conrad grouped several forms under the name *N. Syriaca*, from these Dr. Blanckenhorn has eliminated all but the one represented by fig. 72 of Conrad's report, as above-stated. Of this form there are fragments in the collection at New Haven which are nearly, if not quite, four inches in diameter. Of the other forms I have identified the following :

N. Fleuriausa (D'Orb.), Frass.

N. Mamillæ, Frass.

N. Nobilis (Munst.), Goldfuss.—Of this species some have reached a diameter of fully two inches. I am inclined to think that *N. abundans*, Frass, as figured by Blanckenhorn, Pl. 8, fig. 13, belongs here.

N. Schicki, Frass.—This gives us eight species for the Cretaceous formations in these parts of Syria. Quite a sufficiency.

Cryptoplocus Libanensis, *Hamlin*, Mem. Mus. Comp. Zoöl., X, p. 26, Pl. 2, fig. 8 *a*, *b*.

Very good shells of this species show a size much above that given by Mr. Hamlin, with volutions sometimes much more rounded, especially below, and with an open umbilicus, which, in one specimen, is open two-thirds of the shell's length, being in fact a hollow columella or axis. None of the specimens show or reveal, on working, anything of the necessary ridge on the upper side of the aperture necessary to constitute the genus *Cryptolocus*, and I am at a loss to know to what genus to refer it. It appears to be simply a perforated *Turritella*.

CERITHIDÆ.

Genus CERITHIUM, *Brugiere.*

Cerithium magnicostatum, *Conrad* sp.= *Turritella magnicostatum*, Off. Rept., p. 221, Pl. 10, figs. 63 and 64.

Not *Alaria monodactyla* (Hamlin), Blanck., or *Cerithium magnicostatum*, Noetling, Zeitsch. der Deutsch. Geol. Gesell., Pl. 27, fig. 5, 5 *a*, *b*, 1886, and as cited by Blanckenhorn.

The *C. magnicostatum* of Conrad is a very strongly marked species, and attains a large size. It never presents anything like the appearance of *Alaria monodactyla*, Hamlin, which is from a higher bed, and is a true *Alaria*, while Conrad's species is a large shell attaining a length of between three and four inches, and has a much thickened *cerithium*-like lip. It differs also greatly from the form figured by Noetling under the same name, and which I have herein described under the name *Potamides distortus*.

Cerithium libanoticum (Frass), Blanck., as given on Pl. 6, fig. 10, "Aus dem Oriet," Part II, is from a specimen of Conrad's *Cerithium magnicostatum* as I have identified his figure. This name is also found, according to Blanckenhorn, attached, by Dr. Frass,

to the fossils in the collection at Stuttgart, represented by fig. 10, Pl. 8, [VI.] of Part II, "Aus dem Orient," which is a very characteristic example of *Cerithium magnicostatum=Turritella magnicostata*, Conrad, as seen when partly denuded of the shell.

Cerithium bilineatum, Conrad, Off. Rept. Appendix, Pl. 5, fig. 39, p. 233. The specimens which I have identified with this figure and description belong to the *Pyramidellidæ*, and are near *Obeliscus*. The columella is short and has only one obscure fold bordering the very narrow basal channel. It varies greatly in the degree of expansion in different individuals, the apical angle of some being twice that of the others. They are all, however, slightly shouldered or chamfered on the upper margin of the volutions, the feature which I suppose to be what Conrad refers to as "bilineated." The general habit of the shell strongly reminds one of those on which Morris and Lycette founded their genus *Ceritella*, though their shell does not appear to have had so long a columella, and moreover shows evidences of a plication or fold. It is not uncommon in the brown clays near the summit of the Gazelle Mt., near Abeih, Syria.

Cerithium Conradi, n. sp.

PLATE 9, FIGS. 11 AND 12.

Shell small, the usual size being about three centimeters in length. Spire elevated, slender and turrited. Volutions, about twelve in number, vertical on the exposed surfaces between outlines, and somewhat step-like, or shouldered, on the upper edge, especially on the last volution and near the aperture; lower side of the last volution angular, squarish, presenting the appearance of that of a species of *Turritella* when the aperture is imperfect. Aperture small, scarcely expanded, the lower canal quite indistinct, but visible; posterior canal stronger, formed principally by a pinching together of the side of the volution; inner lip distinct. Surface marked by two spiral lines of nodes, the upper strongest and just below the suture; the lower line of smaller transverse nodes situated just above the suture. On the base of the last volution a sharp seminodose carina marks the lower lateral angle with two or more spiral lines between it and the beak.

Somewhat resembles *C. Gallicum*, D'Orb., Pal. Franc. Terr. Cret. Vol., Pl. 231, fig. 7, but differs entirely in the form of the aperture and canal.

Locality.—In the Abeih sandstone at Duccûn, near Abeih, Syria.

Genus VERTAGUS, *Klein.*

Vertagus coloratus, n. sp.

PLATE 9, FIGS. 17 AND 18

Shell of medium size, attaining a length of about 32 mm., and composed of ten to twelve volutions. Spire elevated, turreted, the volutions vertical on their outer face, and each one slightly shouldered at the top; giving a scalariform character to the whole spire. Aperture somewhat contracted on the back, the anterior canal twisted and reflected, and the posterior canal narrow and pinched as it were by the flattening of the aperture, giving an apertural axis very oblique to that of the shell. Surface of the shell marked by from twelve to eighteen vertical folds, fourteen or fifteen being the prevailing number, and also by alternating spiral thread-like lines, and on the base of the last volution by one strong spiral carina, more or less nodose, forming the angle of the volution; below which there are two or three other spiral lines, slightly nodose, with intermediate finer lines, like those on the body of the volution. Oblique columellar fold obscure or obsolete.

The stronger spiral lines on the volutions appear to be composed of a more dense substance than other portions of the shell, and are all of a deep brown color, appearing as color bands on the shell, sometimes very distinct and conspicuous.

Locality.—In the Abeih sandstone at Klelay, south of Abeih, Syria.

Genus POTAMIDES, *Brongniart.*

Potamides? distortus, n. sp.

PLATE 9, FIGS. 19 AND 21.

Cerithium magnicostatum (Conrad), Noetling, Zeitsch. d. Deutsch. Geol. Gesel., 1886, p. 872, Pl. 27, figs. 5 *a*, *b*.

Shell of about a medium size, the average length being about three and a half centimeters; spire elevated, turriculated, apical

angle about twenty-five to twenty-eight degrees; volutions ten to twelve, rounded between sutures and the latter distinct; last volution inflated and pouched in the outer half to form the somewhat expanded and eccentric aperture, frequently carinated on the back of the expanded portion; aperture large, transverse, the outer lip prolonged in the middle and the margin sinuous and thickened, canals indistinct; columella sinuous, flattened. Surface of the volutions marked by sixteen or seventeen vertical equidistant costæ, which are slightly bent backward in the middle, rounded on the crest and with concave interspaces; these become irregular, indistinct, or greatly exaggerated, and bent forward on the outer half of the last volution, but do not extend below the line of the periphery, but are there replaced by six or eight spiral lines, which become strong and deeply marked on the back of the mouth.

The earlier volutions of this species bears a very strong resemblance to the figures of *Scalaria Goryi*, Frass, from near the Dead Sea (Ann. des Sciences Geolog., Vol. 3, p. 44, Pl. 10, figs. 6 and 7,) and I had at first referred it to that species doubtfully; but, on critical study, I have concluded that it cannot be the same, as they never present the closely arranged vertical plicæ shown on his figures of natural size.

This shell has been referred to Conrad's *C. magnicostatum* by F. Noetling, as above-cited, but it bears not the slightest resemblance to that species, when compared with it. The shell does not conform strictly to the characters of the genus *Potomides*, or of any of the established groups of the *Cerithiidæ*. It seems to partake of those of that group and of *Tympanotus*, but not to be strictly referable to either of them. Neither the anterior or posterior canals are well developed, but both are indicated by broad sinuosities in the lip, while the outer border of the aperture is much thickened, flattened on the inside and its margin extended between the sinuosities. The general appearance of the shells might call to mind the genus *Arrhoges*, Gabb., and *Anchura* among the *Aporrhaidæ*, especially from the carination of the outer volution, but the form of the aperture at the junction of the columella entirely forbids this reference.

Locality.—In the Abeih sandstone at Duccûn, near Abeih, Syria. Rather abundant.

Genus CERITHIOPSIS, *Forbes and Hanley.*

Cerithiopsis cretacea, n. sp.

PLATE 9, FIG. 22.

Shell attaining a length of 12 or 14 mm.; very slender and turreted; composed of about ten volutions, which are closely and compactly coiled, with slightly marked sutures; the surface between the sutures being low convex; upper volutions increasing more rapidly than those below the middle of the length, where the shell becomes more nearly cylindrical. Aperture small, the inner lip reflected over the columellar side of the volution. Surface of the shell marked by five or six spiral ridges or lines of minute nodes or granules, with finer microscopic lines between; also by numerous irregular varices scattered throughout the length of the shell.

This species is almost a facsimile of living shells, known under the name *Cerithiopsis costatus*, DeCosta sp., from the European seas.

Locality.—In the Abeih sandstone, at the Olive locality, near Abeih, Syria.

NERITIDÆ.

Genus NERITA, *Linn.*

Nerita Abeihensis, n. sp.

PLATE 10, FIGS. 1 AND 2.

Shell small, the largest diameter 8 mm. by a height somewhat less; form subglobose, slightly transverse; volutions about three in number, the inner ones exposed for about one-third of their diameter, and slightly elevated above the last one, although the latter forms nearly the entire bulk of the shell. Surface smooth, or marked only by transverse lines of growth; aperture semi-ovate, the opening narrow-crescentiform from the protrusion of the middle of the columellar lip, which is armed by a heavy projecting callus, divided in the middle so as to form two teeth, the division, however, being slight; outer lip thickened and sloping inward; columellar lip convex in the middle, and depressed at the lower part.

Differs from the two associated forms in its globose, naticoid form. Somewhat resembles *N. hemispherica*, Roemer, as figured by Morris and Lycett in their fossils of the Great Oolite, p. 58, Pl. 11, figs. 14 and 16, except in size and in the form of the callus of the columellar lip; that one not being dentate.

Locality.—In the Abeih sandstone, at the Olive locality, near Abeih, Syria.

Nerita bidens, n. sp.

PLATE 10, FIGS. 3–5.

Shell small, the largest of three individuals, all well preserved and well marked, measures just 9 mm., in its greatest diameter, by 5 mm. in height. Volutions in the larger one nearly or quite four, very rapidly expanding laterally, flattened on the top; the inner ones sharply carinate on the margin, but the outer one rounded on the periphery. Aperture patulose, as wide as high on the margin, but contracted to vertically broad oval from the thickening of the outer lip and the concave margin of the columellar lip. Columella depressed, almost excavated, and marked by two proportionally large, distant teeth on the margin. Surface of the shell marked by transverse lines of growth. The older shell shows an inner light colored layer and an outer thicker layer of dark colored shell substance.

This species bears some slight resemblance to *Nerita pseudocostata* (D'Orb. sp.), Morris and Lycett, Pub. Palaeont. Soc., London, 1850, Mollusca Great Oolite, p. 114, Pl. 15, figs. 3 and 3 *a*, but is not so lofty, is more oblique, and is not so strongly plicated or costate.

Locality.—In the Abeih sandstone, at the Olive locality, near Abeih, Syria.

Nerita pagoda, n. sp.

PLATE 10, FIGS. 6–8.

Shell small, the largest specimen observed measuring 7 mm. in its greatest diameter, which is obliquely across the aperture and body volution, while the vertical height is just about the same. Volutions about three or three and a half in the largest one. Spire elevated, having an apical angle of nearly or quite ninety degrees; periphery of the volution strongly carinate, and the

space above the carination concave. Aperture oblique, semi-lunate in form, the outer margin thickened and chamfered; columella somewhat depressed, its border marked with two strong teeth near the middle of its height. Surface of the shell smooth.

This species differs from the *N. bidens* in the elevated spire and carinated whorls with concave surface between sutures.

Locality.—In the Abeih sandstone at the Olive locality, near Abeih, Syria.

TROCHIDÆ.

Genus TROCHUS, *Linn.*

Trochus striatofundus, n. sp.

PLATE 10, FIGS. 9–11.

Shell small, the largest individual obtained being only 8 mm. high by a transverse diameter at the base of nearly the same; spire only moderately high, having an apical angle of about forty-five degrees, and composed of about six volutions, which are flattened in the direction of the spire, with usually obscure suture lines; although several of the examples show the last volution, or one and a half volutions, so coiled as to contract the upper edge to considerable within that of the volution above it. Base convex; aperture oblique; margin continuous and thickened, giving the mouth a circular form within. Surface marked by three carinæ, one at the angle of the periphery, one at the upper or sutural margin, and one about midway between; between these there are one, two or three smaller spiral ridges. The base is also marked by numerous, rather fine, spiral striæ.

This species bears considerable resemblance to *T. spiratus*, D'Archiac, as figured by Morris and Lycette in the Vol. of the Palæont. Soc., London, publications for 1850, Mollusca from the Great Oolite, p. 106, Pl. 13, fig. 6, but differs in having a striated base. It is not a true *Trochus*, as the limits of that genus is now defined, nor does it appear to conform to any of the subdivisions of the family, but combines features of both *Trochus* and *Turbo*, so that it may ultimately be necessary to remove it to a division of its own.

Locality.—In the Abeih sandstone, at the Olive locality, near Abeih, Syria.

Genus MONODONTA, *Lamarch.*

Monodonta antiqua, n. sp.

PLATE 10, FIGS. 12 AND 13.

Shell small, the extreme height being between 9 and 10 mm., and the extreme diameter of the last volution, of the lagest specimen, about 1 mm. less. Volutions five to six, the last one suddenly deflected downward on the upper side just at the lip of the aperture, showing the adult age of the specimen; all the volutions are flattened between sutures in the direction of the spine; the last one rounded on the periphery and below; apical angle seventy to seventy-five degrees; aperture nearly round, much advanced on the upper side; lip thickened and bearing three teeth on the inner surface; columella somewhat flattened and bearing a strong tuberculiform tooth just at its base. Surface marked by about eleven spiral ridges, one on the periphery, four above it, and five below on the last whorl; also by transverse ridges of nearly equal strength and distance, cutting the upper surface into deep and strong reticulations; below the periphery the transverse ridges are finer and much subdued, only finely crenulating the spiral ridges.

Compares well with *Trochus monilitectus*, Philips, Morris and Lycett, Moll. Great Oolite, p. 116, Pl. 15, figs. 1 and 1*a*, but is broader and is lined below as well as above the periphery; but it differs materially also in the structure of the aperture. Dr. Max Blanckenhorn's *Delphinula Porteri* quite closely resembles this shell, but is more laterally spreading with more distinct sutures, besides it would appear to be umbilicated if referable to *Delphinula*, while this species is imperforate with the tooth of *Monodonta*. They are from the same horizon.

Locality.—In the cherts of Gazelle hollow, near Abeih, Syria.

PHILINIDÆ.

Genus PHILINE, *Ascanias.*

Philine (Megistostoma) patula, n. sp.

PLATE 10, FIGS. 16 AND 17.

Shell rather large, having about the dimensions of *P. aperta*, Lam., or of *P. Schroeteri*, Phill., living species, or measuring

about 23 mm. in its greatest length ; broadly patulose in form, the coiled volution being small and much resembling that of the species above-mentioned. Coiled volution coated by the inner lip substance, so as to present a thickened margin or columellar edge, as in most forms of *Bulla.* Surface of the shell marked by distinct growth lines.

This species presents the features on the columellar lip of that described by W. M. Gabb in Vol. 1, Pal. California, p. 144, under the generic name *Megistostoma* (=*Megistoma*, Tryon, Struct. and Syst. Conch.), and if that genus should be adopted, would properly fall under it. Still the slight thickening of the inner whorl by a thin deposit on its surface is a rather poor generic distinction.

Locality.—Two specimens only have been received, and they are both from the coarse siliceous sandy parts of the Abeih sandstone, at Duccûn, Syria.

TORNATELLIDÆ.

Genus ACTÆONINA, *D'Orb.*

Actæonina Syriaca, n. sp.

PLATE 11, FIGS. 10 AND 11.

Shell large, the largest individual in the collection having a transverse diameter of three centimeters, and must have been between seven and eight centimeters long. The perfect one has a diameter of about 23 mm. and a length of 6 centimeters. The general form is cylindrical, somewhat contracted below ; spire short, the apical angle varying in different specimens from seventy-five to ninety-eight degrees. Aperture narrow, very contracted above, wider below and narrowly rounded, from four-fifths to nearly nine-tenths of the length of the shell, in different specimens according to the height of the spine ; outer lip thin and sharp ; columellar lip thickened, reflected over the umbilical area below so as to present almost the appearance of an open umbilicus, but which is partially filled with a deposit. Surface of the shell only with irregular growth lines.

This shell looks like a cylindrical *Olive*, but differs entirely in the form of the aperture at the base. It is easily confounded

with *Actæonella Salomonis*, Frass, but on close examination is found not to have any plications on the very thick, strong columella; even when broken back to the extent of an entire volution, the columella is smooth.

This shell differs from *A. oviformis*, Blanck., Beitrag. zur Geol. Syriens, p. 117, Pl. 9, fig. 13, in the relative height of the spire and in its more cylindrical form. That one having a spire equal to or more than half the entire length, as shown by the figure, and the form is fusoid largest in the middle, while this one is cylindroid-oval, thus presenting an entirely different character.

Locality.—In the Abeih sandstone at Klelay, and a single individual, apparently the same, comes from the chert bed of Gazelle Mt., near Abeih, Syria.

Actæonina Marahhensis, n. sp.

PLATE 10, FIGS. 18 AND 19.

Shell having a length of 15 mm. and a diameter of 7 mm.; form ovoid, spire moderately elevated, with six or seven volutions, not channelled, but slightly shouldered on the top, with distinct sutures; body volution moderately convex in the upper part, more rapidly rounded below to the base. Aperture two-thirds of the entire length, narrow above, and only moderately wider below; columella smooth, destitute of folds, curved at base and scarcely thickened. Surface with fine obscure spiral lines, closely arranged and alternating in size, at least near the base.

Differs from *A. vafra*, Hamlin, in its proportions, especially in the width of the aperture, and also in possessing the spiral lines, and from all and any of the other associated shells of this group, except *A. Syriaca*, Whitf., herein described, in wanting the columellar folds. From this latter it differs entirely in general form.

Locality.—As casts in yellowish clays at Marahh, near Abeih, Syria, in the Bewerty horizon.

Actæonina vafra, *Hamlin*, Mem. Mus. Comp. Zoöl., Vol. 10, p. 29, Pl. 3, fig. 1. This is a well-marked species, and is apparently quite abundant at Duccûn, near Abeih, in the sandstone. Dr. Blanckenhorn has cited this species as a synonym of *Natica olivæ*, Frass, Aus dem Orient, II, p. 66, which that author par-

tially describes, but does not figure. I cannot think Dr. Frass would have compared such a shell as this species with such forms as *Natica extensa* and *N. pungens* (Sow.), D'Orb., one of which has the form of a *Paludina*, and the other is apparently a true *Littorina* (see figures in Min. Conch., Pl. 31, fig. 2, and Trans. Geol. Soc., London, Vol. 4, 2d Ser., Pl. 18, fig. 5, Sowerby's original figures). I am much more inclined to think Dr. Frass had in mind when he wrote his description of *Natica olivæ*, a form like Hamlin's *Amauropsis Abeihensis*, many specimens of which correspond with Sowerby's figure of *N. extensa*. I therefore retain Dr. Hamlin's name *A. vafra*.

Genus TORNATELLA, *Lamarck.*

Tornatella Abeihensis, n. sp.

PLATE 11, FIGS. 8 AND 9.

Shell elongate or subfusiform, about 12 mm. high six across the body whorl; spire elevated, forming about half the height, the aperture being of equal height. Volutions five to six, but very moderately ventricose between sutures, the latter being very distinct and the top of the volution very narrowly shouldered. Aperture narrow; columellar lip with an elongated tooth-like fold, which is divided in the middle, but not as deeply as the space above and below. Surface marked by numerous impressed lines, which are obscurely punctate in the bottom.

This species is so nearly like many others, Cretaceous, Tertiary and recent, that I have not thought necessary to institute comparisons or make identifications.

Locality.—From the Abeih sandstone, at the Olive locality, near Abeih, Syria.

Genus ACTÆONELLA, *D'Orb.*

Actæonella abbreviata, Conrad's sp.

Nerinea abbreviata, Conrad, Off. Rept. Dead Sea, p. 233, App., Pl. 5, fig. 36.

? Phasionella absalonis, Frass, Aus dem Orient, I, p. 96, Pl. 1, fig. 3.

Actæonella absalonis, Frass, Ibid, II, p. 65, Pl. 6, fig. 9.—Blancken., Beitrage. zur Geol. Syriens, p. 117.

I see no reason why Conrad's specific name should not be retained for the above shell. The fact of there being a species *abbreviata* in the genus *Actæonina* should not throw out this form *Actæonella*, and certainly *Itieria* (*Nerinea*) *abbreviata*, Phil., can in no way be considered as a synonym, as indicated by Blanckenhorn; but even then the part of this shell having three distinct folds on the columella removes it entirely from these genera into that of *Triptycha*, Müller, and it should now stand as *Triptycha abbreviata*, Conrad's sp.

COLOSTRACON LEWISI, *Frass.*

Colostracon Lewisi, Frass sp., after Blanck.

Colostracon curtum, Hamlin, Mem. Mus. Comp. Zoöl., X, Pl. 3, fig. 4.

Colostracon sinuatum, Hamlin, Ibid, fig. 2.

Colostracon Lewisi, Frass, and *C. sinuatum*, Hamlin; Blanck. Bet. zur Geol. Syriens, p. 117.

The specimens of this shell in our collection show unquestionably that the three forms above cited are only varieties of the one species.

Genus TYLOSTOMA, *Sharpe.*

Tylostoma Syriaca, Conrad's sp.

Chenopus Syriaca, Con., Off. Rept. Lynch's Expl. Dead Sea, p. 220, Pl. 12, fig. 71.

Tylostoma? Syriaca (Conrad), Hamlin, Mem., p. 19, Pl. 1, fig. 6.

Natica prælonga (Desh.), Blanck., p. 104.

Comparing these specimens with D'Orbigney's figures of the *N. prælonga*, I should not think them the same. Moreover, the casts in our possession show very distinctly the periodic thickening of the shell which is characteristic of the genus *Tylostoma*, the supposed absence of which appears to have been the reason Dr. Blanckenhorn considered them identical with the French shell, which does not possess them. *T. Birdana*, Hamlin, *T. Gazellensis*, *T. Martini* and *T. triplica*, W., all show more or less distinctly this peculiarity. *T. gradata*, Haml., *T. indurata*, Conrad's sp., and *Globiconcha altispira*, W., do not show it.

Tylostoma Martini, n. sp.

PLATE II, FIGS. 6 AND 7.

Shell small, the height being about 15 mm., and the breadth of the body volution a little greater. Spire short, the apical angle being scarcely less than ninety degrees; volutions about six in number, very ventricose between sutures, the body whorl forming the great bulk of the shell. Aperture narrow, elongated, a little more than half as long as the shell; columellar lip callous and thickened, base rounded into the outer lip of the shell. Volutions with a strong varix at each half turn and flattened somewhat in the direction of the opposite diameter. Surface of the shell apparently smooth.

As compared with *T. Abeihensis*, Hamlin (Mem. Mus. Comp. Zoöl., Vol. 10, Pl. 1, fig. 4), this shell is very much smaller, more flattened laterally, with comparatively stronger varices and very much more ventricose volutions, the breadth being greater than the height, while the reverse is the case in that one.

Locality.—In the cherts of the Gazelle Mt. series, at Gurzûz, near Abeih, Syria. The specimen was presented by Dr. D. S. Martin, of New York city.

Genus GLOBICONCHA, *D'Orb.*

Globiconcha (Tylostoma?) Gazellensis, n. sp.

PLATE II, FIGS. 1–3.

Shell small, the largest specimen out of quite a number having a vertical height of 19 mm. by a transverse diameter of 16 mm., while the height of the aperture is about 13 mm. General form of shell globular, or very broadly ovate, erect; volutions five or more in adult specimens, very ventricose between sutures, the outer one, as measured on the face of the shell, forming the great bulk of the whole, being 17 mm.; aperture oblique, widest below; outer lip thin; axis solid. Surface of the shell marked only by transverse lines of growth.

There is some difference among the different individuals in the elevation of the spire, as seen on half-grown specimens. Some of them having the sutures more deeply sunken and the two or three earlier volutions more pointed, while a few of them are very

slightly flattened or shouldered on the upper surface, in which case they present something of the form of *Natica orientalis*, Conrad (Lynch's Exped. Dead Sea, Pl. 5 of the Appendix, fig. 41), but the character of the axis will at once distinguish it from any *Natica*. The shell belongs to that section of the genus typified by *T. Fleuriausa*, D'Orb., as figured by Chenu in his Manuel Conch. et Palæont. Conch., p. 226, which differs from *Tylostoma* only in wanting the periodic varices.

Locality.—In the yellowish brown calcareous clays at the summit of Gazelle Mt., near Abeih, Syria.

Globiconcha altispira, n. sp.

PLATE 11, FIGS. 4 AND 5.

Shell rather large, being 10 or 12 mm. in length, the body whorl very round and globose, while the inner whorls are more slender and the spire abruptly elevated from the top of the body whorl in a conical form, embracing an angle of from 45° to 60°, and the volutions flattened or bent very slightly convex between the sutures. Aperture semilunate and oblique, prolonged below at the base of the columella, forming a short broad canal. Columella straight, smooth and destitute of callus or folds. Judging from the shell substance left between the volutions of the casts when broken open, the shell must have been very thin and fragile. Surface unknown, but apparently smooth.

The distinguishing feature of this species is its very round and globular body whorl, below a narrow rapidly ascending conical spire of small dimensions; a combination of features not seen to so great an extent in any described form.

Locality.—At Ain Kisûr, near Abeih, Syria, in the upper layers of a brown clay-limestone, resting on the Bewerty clays.

Globiconcha? triplica, n. sp.

PLATE 10, FIGS. 20–22.

Shell of about a medium size, wider than high, with a short spire composed of about six volutions within the body whorl. Volutions very ventricose, flattened on the top, or even channelled, and distinctly triangular from a vertical view, caused by

each of the three outer volutions having three very strong varices or periodic lips, resembling those of the genus *Triton*. These are not opposite each other on the several volutions, but a little in advance, while the space between the varices is somewhat flattened. The earlier volutions are regularly rounded and smooth. Aperture large, ovate, widest below and the lip thickened at this point. Collumellar lip slightly reflected and the axis distinctly umbilicated. Surface of the shell marked by transverse lines of growth, and under a glass by a few very fine spiral lines, most distinct on the flattened upper surface.

The strongly triangular aspect of this shell, as seen in a vertical view, is a very distinguishing character. There may be some question as to its correct reference to the genus *Globiconcha*, but it seems to possess all the essential features and none that are entirely opposed to those of that genus.

Locality.—In the cherts at Gazelle Hollow, near Abeih, Syria.

LOPHOCERCIDÆ.

Genus AKERA, *O. Muller*.

Akera siliciosa, n. sp.

PLATE 10, FIGS. 14 AND 15.

Shell small or of medium size, the largest one observed measuring about 16 mm. in length, in the condition of an internal cast in chert. Form cylindrico-ventricose, the length across the aperture being about two-thirds as great as the height. Spire very short, but disclosing all the whorls, which are two and a half to three in number, rounded with distinct sutures; aperture very large, as long as the shell and broadly effuse at the base. Surface marked by obscure lines of growth and indistinct undulations.

One of the casts shows the columellar margin to have been very slightly thickened forming a distinct border.

Locality.—In the ferruginous cherts at Gurzûz, near Abeih, Syria; at the same horizon as the Gazelle Mt. cherts.

EXPLANATION OF PLATE 4 A.

Lima tenuitesta, Whitf. Page 390.

Figs. 1 & 2. View of the right valve and of the hinge.

Radula Naamansis, Whitf. Page 390.

Fig. 3. View, twice enlarged, of a cast of a right valve.
Fig. 4. Similar view of a specimen preserving some of the shell.

Gervillia obesa, Whitf. Page 391.

Figs. 5–7. Right, left and anterior views of a typical form of the species.

Perna Palestina, Whitf. Page 394.

Fig. 8. Exterior of a right valve, one of the pair represented by fig. 9.
Fig. 9. Anterior profile of a pair of valves.
Fig. 10. Interior view of the valve fig. 8.

Gervillia trapezoidalis, Whitf. Page 392.

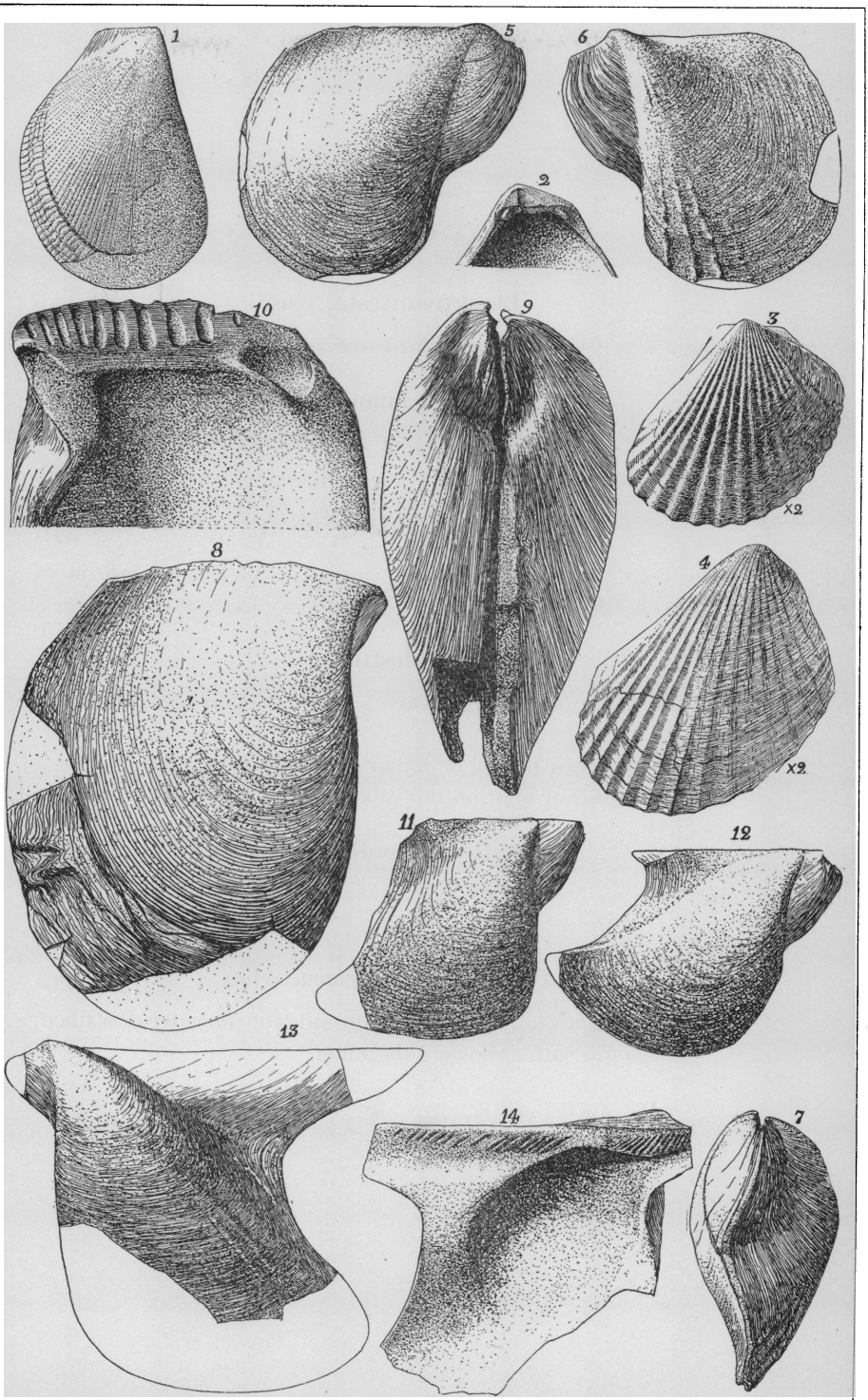
Figs. 11 & 12. Views of two right valves differing some in obliquity.

Pterinoperna Syriaca, Whitf. Page 393.

Figs. 13 & 14. Views of the opposite sides of the valve described, the latter showing the hinge.

SYRIAN FOSSILS.

(Lamellibranchiata.)



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H. C. Brown, Photo Eng.

EXPLANATION OF PLATE 5.

Trigonarca Palestina, Whitf. Page 395.

Figs. 1 & 2. Lateral and cardinal views, three times enlarged, of one of the specimens described.

Nucula glanstriticea, Whitf. Page 396.

Figs. 3–5. Lateral, cardinal and interior views, four times enlarged, of different specimens.

Gervillia perobesa, Whitf. Page 392.

Figs. 6–8. Right, left and cardinal views of a large individual.

Cardita Rawsoni, Whitf. Page 397.

Figs. 9 & 10. Left side and cardinal views of an internal cast of the species.

Opis megambona, Whitf. Page 398.

Figs. 11 & 12. View of the left side, and anterior view of a slightly compressed specimen, enlarged. Fig. 12 shows the deep lunule.

Platopis plicata, Whitf. Page 400.

Figs. 13 & 14. Left and cardinal views, twice enlarged, of a perfect shell, the largest obtained.

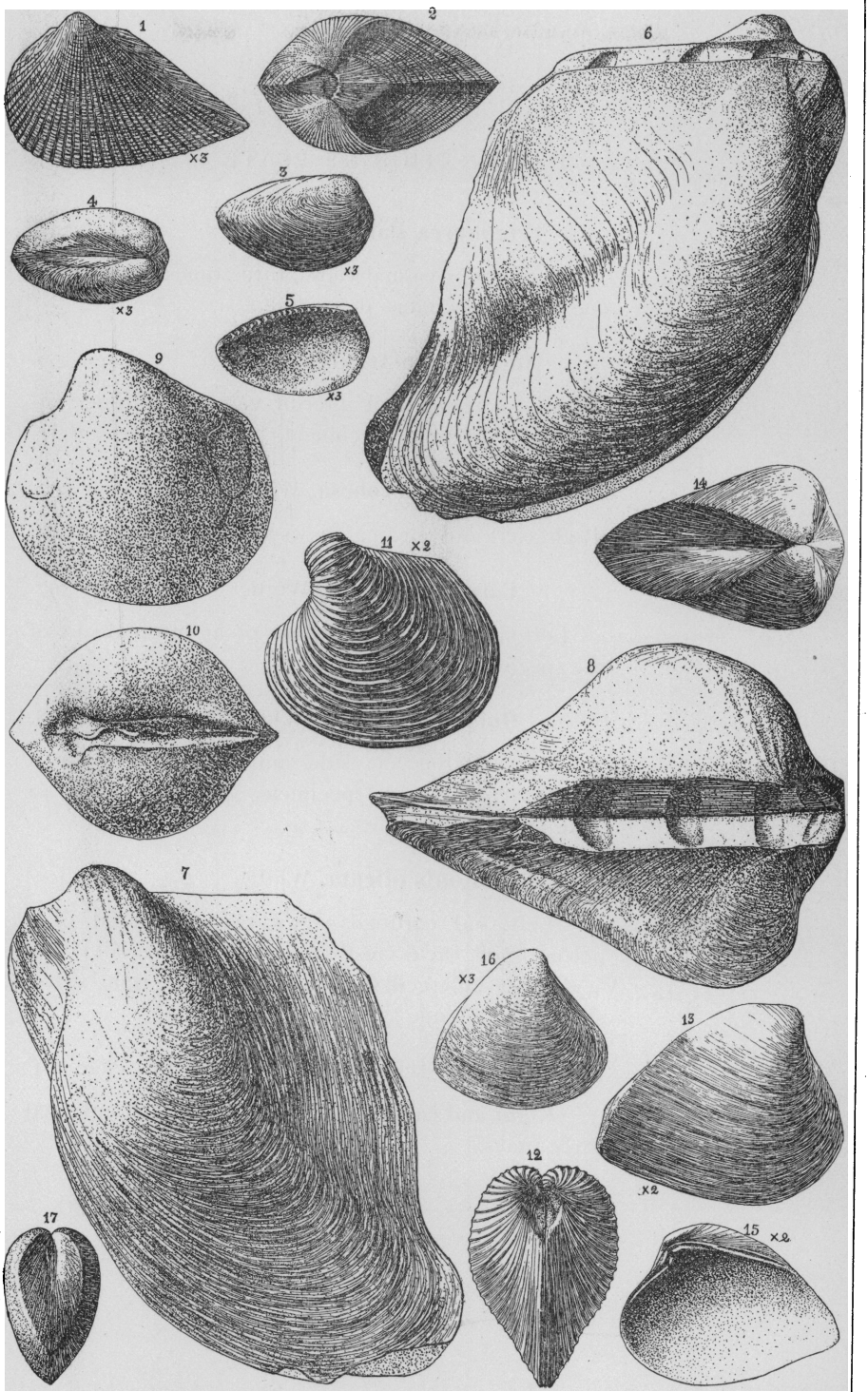
Fig. 15. View, twice enlarged, of the interior of a right valve, showing the hinge structure.

Platopis? triangularis, Whitf. Page 401.

Figs. 16 & 17. Right and cardinal views of a specimen enlarged three times.

SYRIAN FOSSILS.

(Lamellibranchiata.)



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EXPLANATION OF PLATE 6.

Scambula secunda, Whitf. Page 402.

Fig. 1. View of the right side of a shell, two diameters.

Eriphyla crenulicosta, Whitf. Page 403.

Figs. 2 & 3. Left and cardinal views, four diameters, of a very perfect shell.

Figs. 4 & 5. Views of the hinge of opposite valves of the species, four diameters.

Lucina percancellata, Whitf. Page 403.

Fig. 6. Lateral view of a specimen, four diameters.

Cardium (Protocardium?) Birdanum, Whitf. Page 405.

Fig. 7. Right side of a specimen.

Fig. 8. Anterior view of another shell, showing a strong callus beneath the beaks.

Fig. 9. View of a larger, somewhat flattened valve.

Fig. 10. Cardinal view of specimen fig. 7, showing the valves somewhat displaced.

Cardium (Serripes?) Bewertense, Whitf. Page 404.

Figs. 11 & 12. Two views of an entire specimen, showing the true rotundity.

Fig. 13. A larger left valve, showing the hinge.

Fig. 14. Interior of a right valve, two diameters, from the Duccûn beds.

Trapezium Naamanense, Whitf. Page 406.

Figs. 15 & 16. Right and cardinal views, three diameters, of a cast of the species.

Corbicula (Batissa?) Hamlini, Whitf. Page 407.

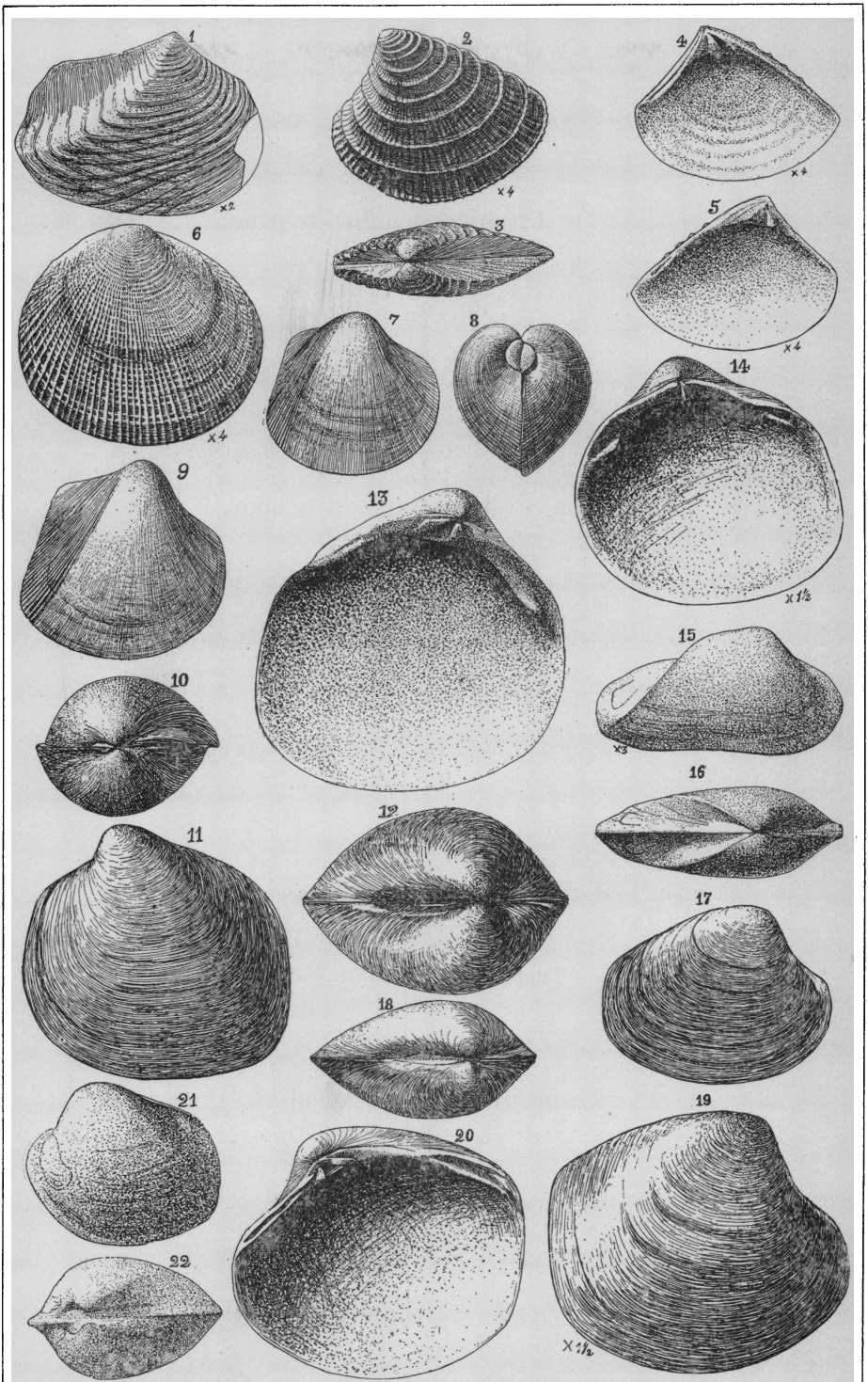
Figs. 17 & 18. Two views of an elongated example, probably somewhat vertically distorted.

Figs. 19 & 20. Exterior and inner views of a valve of quadrangular form, one and a half diameters.

Figs. 21 & 22. Two views of an internal cast of this species.

SYRIAN FOSSILS.

(Lamellibranchiata.)



EXPLANATION OF PLATE 7.

Veleda elliptica, Whitf. Page 406.

Figs. 1 & 2. Right and cardinal views, one and a half diameters, of the most perfect specimen seen.

Corbiculopsis Birdi, Whitf. Page 409

Figs. 3 & 4. Two views of a small shell of perfect form.
Fig. 5. Right valve of a larger specimen.
Figs. 6 & 7. Hinge views of opposite valves, showing the generic features described.

Arcopagia planissima, Whitf. Page 409.

Figs. 8 & 9. Lateral and cardinal views of a cast of the species.

Caryatis globulus, Whitf. Page 410.

Figs. 10 & 11. Two views of a specimen of ordinary form and size.

Donax minutissimus, Whitf. Page 411.

Figs. 12 & 13. Two views of the type specimen, three diameters.

Callista Syriaca, Whitf. Page 411.

Figs. 14 & 15. Two views of a cast of the usual form.

Mactra? Olivensis, Whitf. Page 412.

Figs. 16 & 17. Two views of the largest specimen, two diameters.

Anatina? orientalis, Whitf. Page 412.

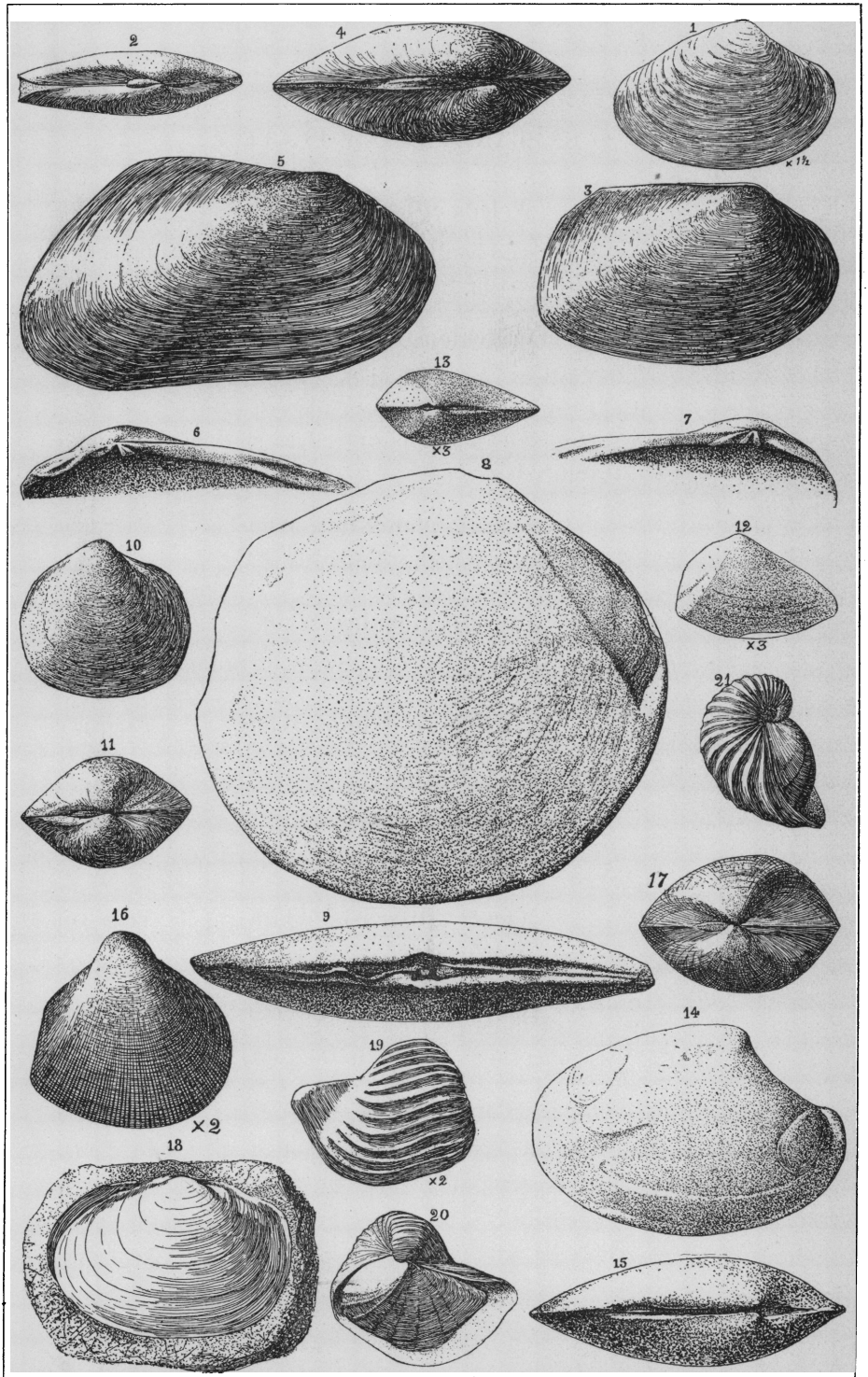
Fig. 18. View of a shell as it lies in the rock.

Corbula olivæ, Whitf. Page 413.

Figs. 19–21. Three views of a very perfect shell, two diameters, showing the features of the species.

SYRIAN FOSSILS.

(Lamellibranchiata.)



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EXPLANATION OF PLATE 8.

Caricella planilirata, Whitf. Page 414.

Figs. 1 & 2. Front and back views of the specimen described.

Volutomorpha? orientalis, Whitf. Page 414.

Figs. 3 & 4. Opposite sides of one of the specimens, twice enlarged.

Mangelia? solitaria, Whitf. Page 415.

Fig. 5. Front view, showing the aperture, three diameters.

Fig. 6. Lateral view, showing the slit in the lip.

Strombus crassaliratus, Whitf. Page 416.

Fig. 7. Front view of the specimen.

Natica (Ampullina) fluctuoides Whitf. Page 417.

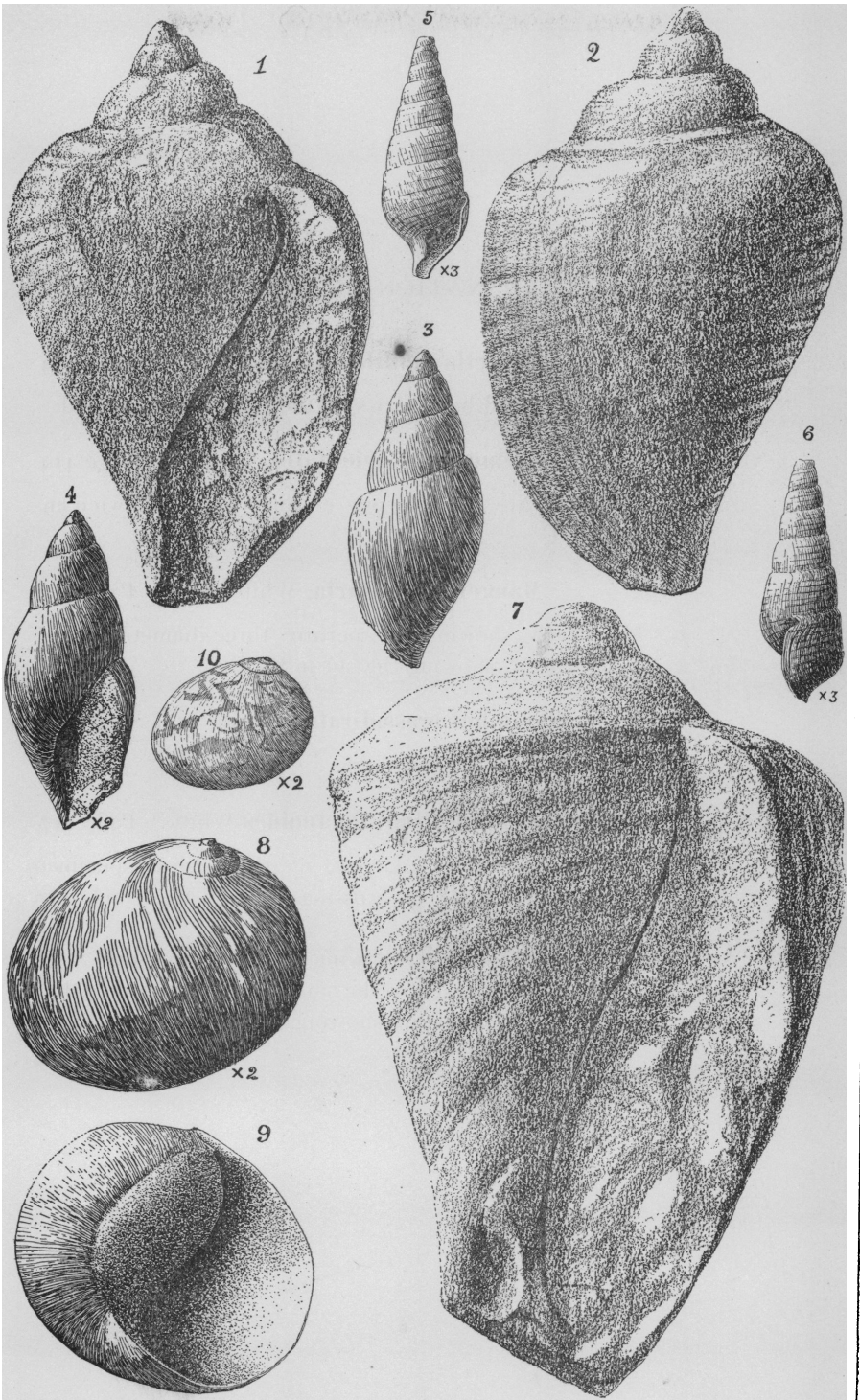
Fig. 8. Back view, twice enlarged, of the largest specimen observed. The lines crossing the shell are deep brown in color.

Fig. 9. View of the aperture, showing the callus and lip.

Fig. 10. View of a specimen of the small variety from the Olive locality, near Abeih, showing zigzag color markings. Twice enlarged.

SYRIAN FOSSILS.

(Gasteropoda.)



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EXPLANATION OF PLATE 9.

Natica (Ampullina) fluctuoides, var. **acuminata,** W. Page 418.

Figs. 1 & 2. Front and back views of the shell, showing the pointed apex.

Neverita patula, Whitf. Page 419.

Figs. 3 & 4. Top and basal views of a specimen, showing the form and callus. Fig. 3 shows the color markings, x 2.

Natica (Ampullina) minima, Whitf. Page 418.

Figs. 5 & 6. Back and front views, three times enlarged, of a specimen which shows the color bands and zigzag markings.

Scalaria novemvaricosa, Whitf. Page 422.

Fig. 7. View, twice enlarged, of a specimen showing all the features except the aperture.

Scalaria Bewertensis, Whitf. Page 421.

Figs. 8 & 9. Similar views, three times enlarged, of two specimens which vary in the number of varices.

Mesalia Gazellensis, Whitf. Page 424.

Fig. 10. View of a shell, three times enlarged.

Cerithium Conradi, Whitf. Page 428.

Figs. 11 & 12. Views, one and one-half diameters, of two different individuals, showing the prevailing features.

Odostomopsis Abeihensis, Blanckenhorn's sp. Page 425.

Figs. 13 & 14. Front and back views of a specimen of medium size of *Phasianella abeihensis*, Blanck., which is the type of the new genus Odostomopsis, Whitf.

Tubulostium rugosum, Whitf. Page 424.

Figs. 15 & 16. Lateral and back views, twice enlarged, of a specimen, showing the prevailing features.

Vertagus coloratus, Whitf. Page 429.

Figs. 17 & 18. Views, one and one-half diameters, of two specimens, showing variations in degree of increase and in surface markings. The aperture in fig. 17 is laterally crushed, and in fig. 18 is partially restored from other examples. The dark spiral lines are the color lines.

Potamides distortus, Whitf. Page 429.

Figs. 19 & 20. Front and back views, one and one-half diameters, of different specimens, showing general form.

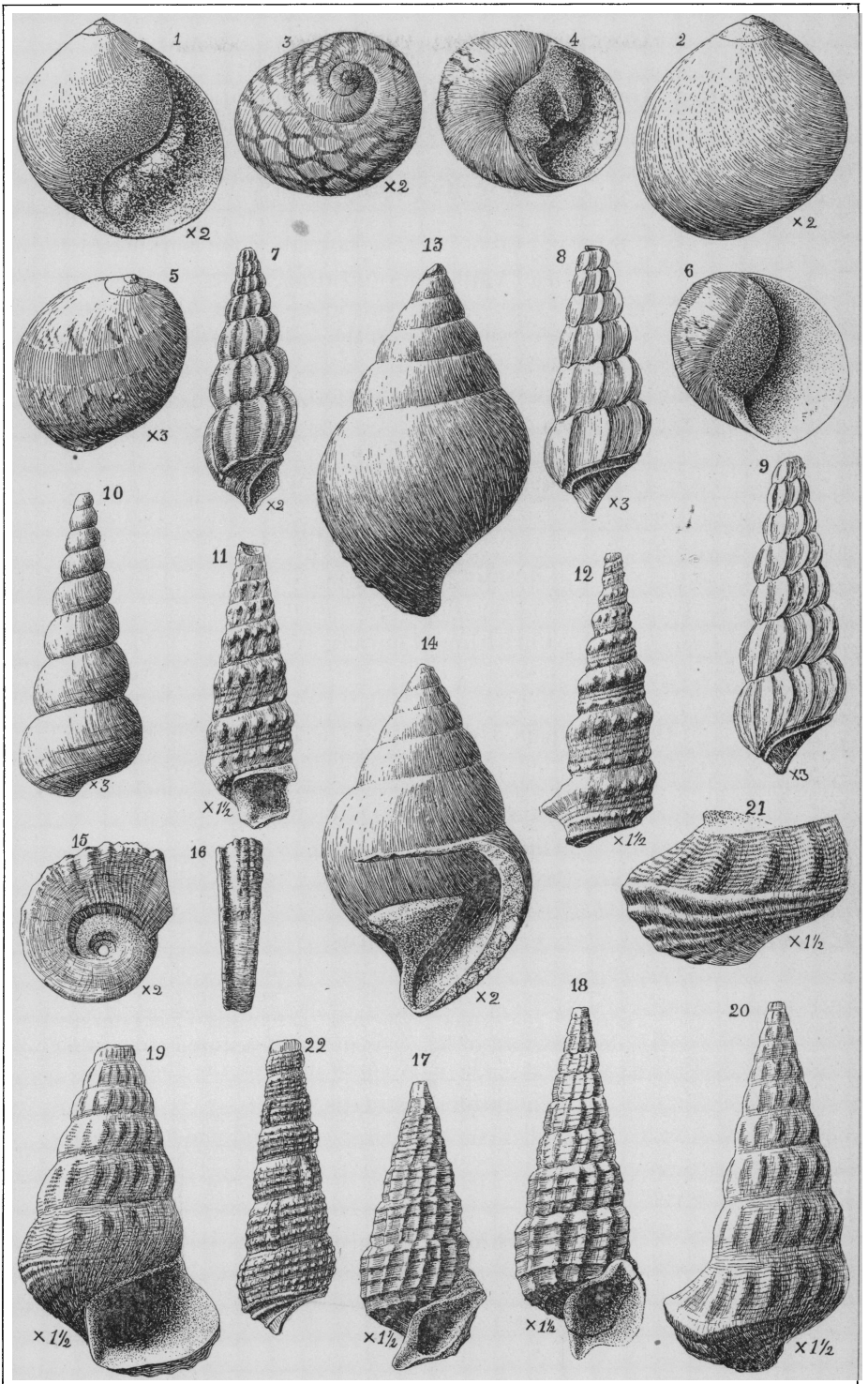
Fig. 21. View of the last volution of a shell, one and one-half diameters, showing stronger plications.

Cerithiopsis cretacea, Whitf. Page 431.

Fig. 22. Lateral view of the specimen described, enlarged three diameters.

SYRIAN FOSSILS.

(Gasteropoda.)



EXPLANATION OF PLATE 10.

Nerita Abeihensis, Whitf. Page 431.

Figs. 1 & 2. View of the aperture, and of the back of a typical specimen, four diameters.

Nerita bidens, Whitf. Page 432.

Figs. 3 & 4. Two views, four diameters, of the largest specimen observed.

Fig. 5. Back view, four diameters, of a smaller shell, showing the angular volution in the young stages.

Nerita pagoda, Whitf. Page 432.

Fig. 6. Back view of shell, four diameters, showing the prevailing features.

Figs. 7 & 8. Two views of a larger specimen, four diameters.

Trochus striatofundus Whitf. Page 433.

Figs. 9 & 10. Two views of the largest example seen, showing the prevailing features.

Fig. 11. Front view of a second specimen. All enlarged four times.

Monodonta antiqua, Whitf. Page 434.

Figs. 12 & 13. Lateral and basal views of a very perfect shell, four diameters.

Akera siliciosa, Whitf. Page 441.

Fig. 14. Front view of a medium sized example.

Fig. 15. Back view of a larger examples, both casts, both two diameters.

Philine (Megistostoma) patula, Whitf. Page 434.

Figs. 16 & 17. Back and front views of the specimen described enlarged one and one-half diameters.

Actæonina Marahhensis, Whitf. Page 436.

Figs. 18 & 19. Two views of the best cast, the apex of which has been broken in the matrix.

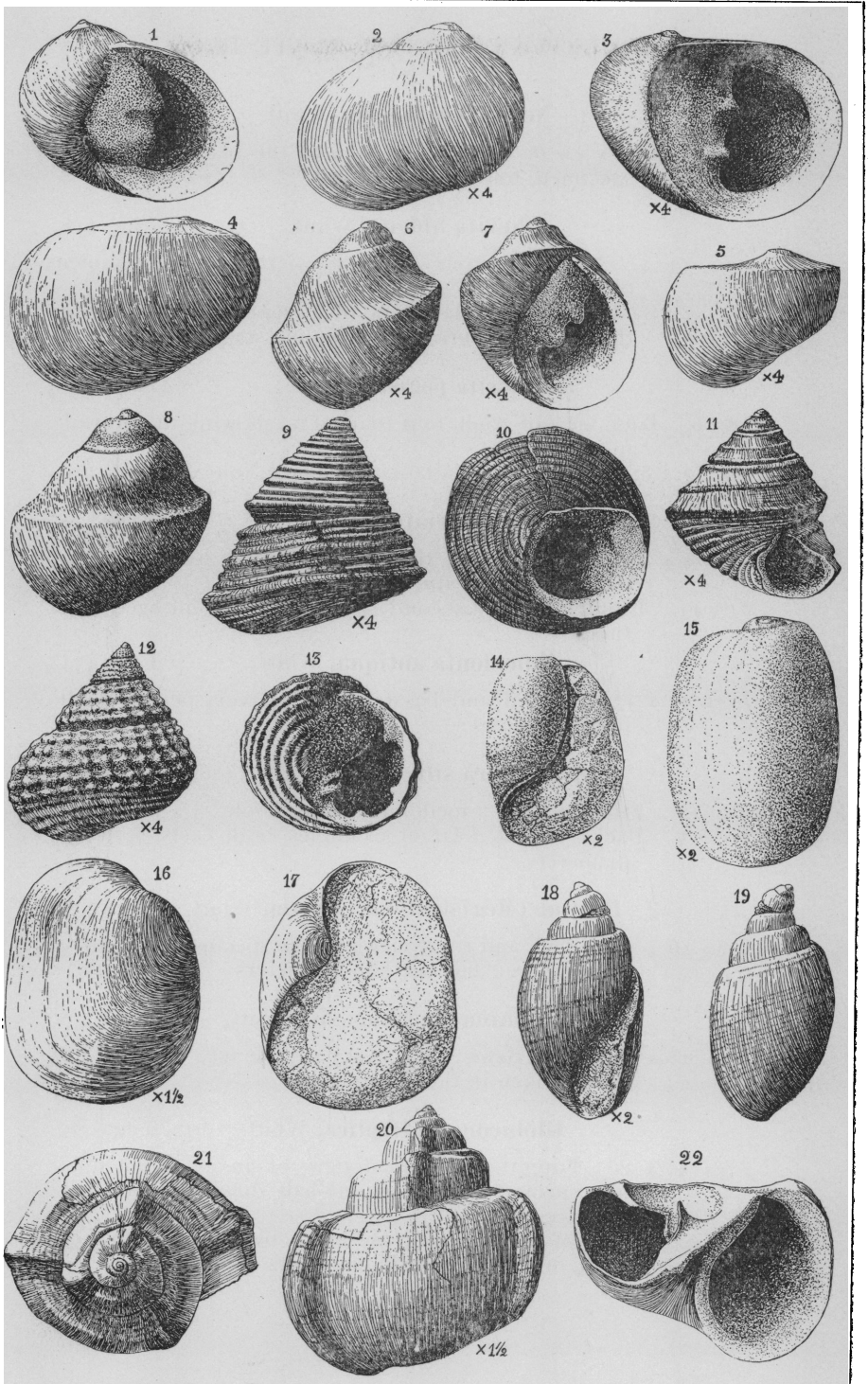
Globiconcha triplica, Whitf. Page 440.

Figs. 20 & 21. Lateral and vertical views of an imperfect silicified specimen, one and one-half diameters, and partially restored.

Fig. 22. View of the aperture, as shown by another imperfect shell, one and one-half diameters.

SYRIAN FOSSILS.

(Gasteropoda.)



EXPLANATION OF PLATE 11.

Globiconcha (Tylostoma) Gazellensis, Whitf. Page 439.

Fig. 1. Front view of a young specimen, two diameters.

Figs. 2 & 3. Two views of a large example, two diameters.

Globiconcha altispira, Whitf. Page 440.

Figs. 4 & 5. Opposite views of two specimens which vary slightly in the height of the spire. Natural size.

Tylostoma Martini, Whitf. Page 439.

Figs. 6 & 7. Front and vertical views of the specimen described, twice enlarged.

Tornatella Abeihensis, Whitf. Page 437.

Figs. 8 & 9. Front and back views, twice enlarged, of the type specimen, which is slightly imperfect.

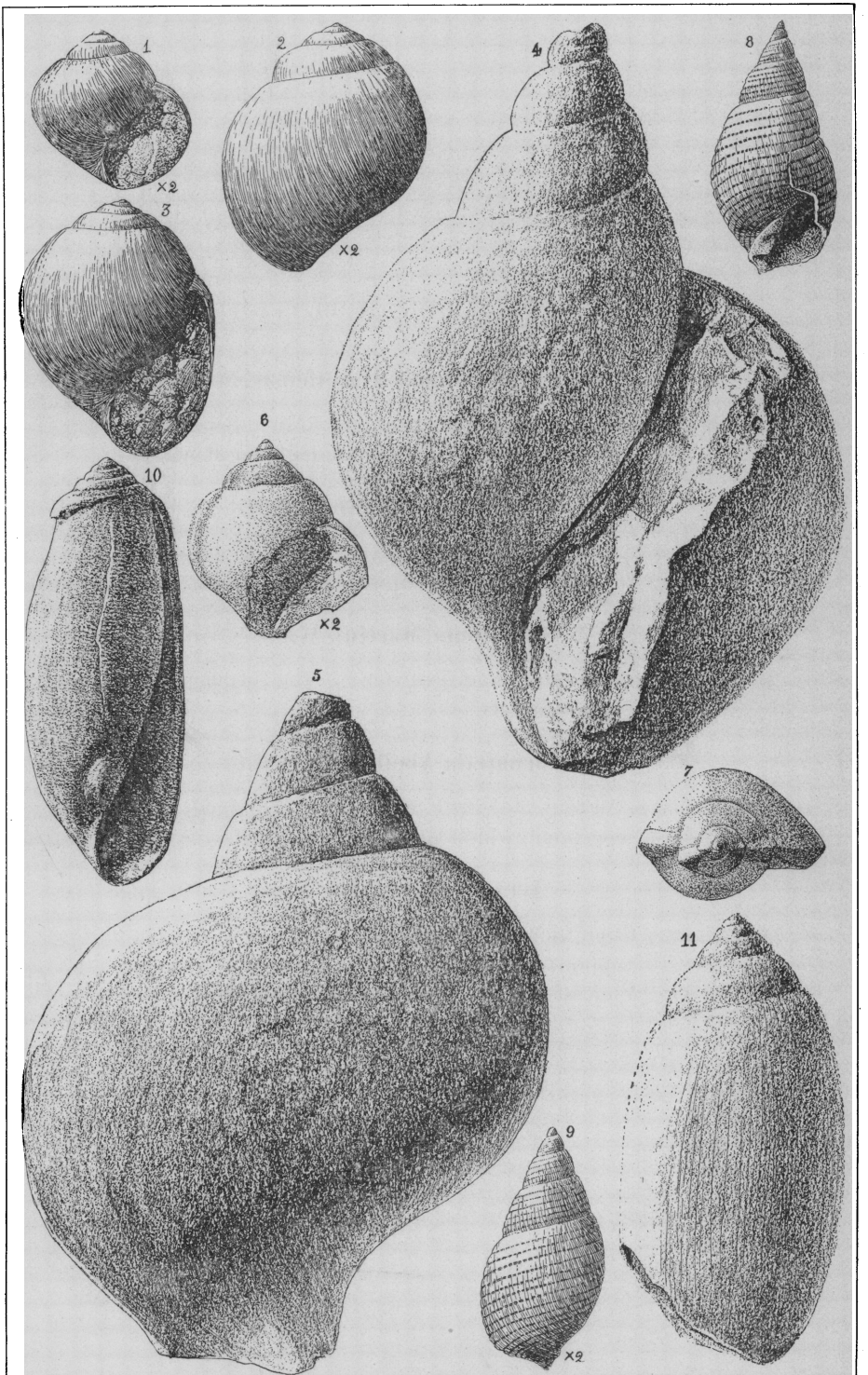
Actæonina Syriaca, Whitf. Page 435.

Fig. 10. Front view of a specimen, natural size, crushed in the upper part.

Fig. 11. View of a much larger imperfect specimen.

SYRIAN FOSSILS.

(Gasteropoda.)



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